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Health and Well-being of Mothers and Young Children in Poverty

by

Krista Marie Hungler ©

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment
of the requirements for the degree of Master of Science

Centre For Health Promotion Studies

Edmonton, Alberta

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Date: June 17, 2003

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Faculty of Graduate Studies and Research

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled Health and Well-being of Mothers and Young Children in Poverty submitted by Krista Marie Hungler in partial fulfillment of the requirements for the degree of Master of Science.

Dr. Deanna L. Williamson

Dr. Nicole L. Letourneau

Dr. Berna J. Skrypnek

Date: May 28, 2003

Abstract

This study focused on the health and well-being of 53 mothers and young children (0-3 years) living in poverty. Bivariate and multivariate analyses examined the relationships among level of family income/depth of poverty, maternal depressive symptoms, maternal-child interaction, and children's cognitive development. Maternal education, child age, and child gender, known to influence these relationships, were also considered. Findings indicate that depth of poverty, maternal depressive symptoms, maternal-child interaction, and child gender predict children's cognitive development. Further, that depth of poverty, maternal education, and child age predict maternal-child interaction. Additionally, boys' cognitive development scores were lower than girls', suggesting that boys are faring more poorly than girls. Clinically significant levels of depressive symptoms were found for over half of the mothers, but these were not associated with maternal-child interaction. Surprisingly, maternal education was negatively related with young children's cognitive development. Overall, findings suggest negative influences of increasing depth of poverty.

The answer to poverty may lie in each one of us, as Ecclesiastes 5: 8-10 states, "if you see the poor oppressed in a district, and justice and rights denied, do not be surprised at such things. . . whoever loves money never has money enough; whoever loves wealth is never satisfied with his income."

Dedication

I would like to dedicate this thesis to my late father, John Frederick Horstemeier, who taught me many things, but most significantly – the one thing most important in life – and who always desired to pursue post-secondary education without having the opportunity to do so. This one is for you Dad!

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CHAPTER 1: INTRODUCTION

This study focused on the well-being of mothers and children in poverty. Though Canada was chosen as the third top country to live in by the United Nations in 2002, 12.4% of families and 18.5% of children in Canada live in poverty (Canadian Council on Social Development [CCSD], 2002; United Nations, 2002). This is one of the highest child poverty rates among industrialized nations (CCSD, 2001a). Poverty presents challenges and has a number of negative consequences for families, children, and society.

Consequences of Poverty for Families and Young Children

Canadian families in poverty experience difficult circumstances, which have negative consequences for all who are entrenched (Brooks-Gunn & Duncan, 1997; Chase-Lansdale & Brooks-Gunn, 1995; Keating & Hertzman, 1999; Luthar, 1999). While average Canadians are able to purchase goods and services such as cars, clothes, convenience foods, microwaves, bulk supplies, and child care services, it is not uncommon for those in poverty to use food banks and have difficulty finding affordable housing (National Council of Welfare, 2002). Canadians in poverty are often unable to afford sports and recreational activities, cultural festivities, and other enriching pursuits (National Council of Welfare, 2002; Ross & Roberts, 1999).

Parents living in poverty have to make difficult choices about the small amount of income that is available. For example, a typical question may be "Should I pay the rent this month or feed the children?" (Halpern, 1993, p. 78). Families in poverty are continually trying to survive without an adequate income to do so. Unfortunately, extended family, friends, or neighbours in close proximity - the social networks that are usually available to help - are frequently undergoing similar hardships themselves (Halpern, 1993).

Compared to non-poor Canadian children, poor children are more likely to live with parents who exhibit frequent signs of depression and have higher levels of stress. Thus, it is not uncommon for poor children to experience lower levels of family functioning. Additionally, impoverished families frequently change accommodations and have a greater likelihood of living in substandard housing (Ross & Roberts, 1999).

Considering the challenges that poverty presents to families, it is not surprising that literature, mainly from outside of Canada, has established negative associations between poverty and both maternal mental health and maternal-child interactions. In addition, maternal depressive symptoms have been found to negatively influence maternal-child interaction. Furthermore, poverty, maternal depressive symptoms, and less than optimal maternal-child interactions, all are negatively associated with young children's cognitive development (see Chapter 3).

Consequences of Poverty for Children's Health and Development

Studies repeatedly reveal the negative effects of low income on children's health and development (Duncan & Brooks-Gunn, 1997; Huston, 1991; National Forum on Health, 1997; Ross, Kelly & Scott, 1996; Wade, Pevalin, & Brannigan, 1999). Physical, social, and emotional health disabilities, such as chronic illnesses and developmental delays – all have been found to be roughly twice as high among Canadian children living in low-income families, as compared to children from high-income families (Ross et al., 1996). Furthermore, persistent poverty contributes to the accumulation of risks to children's health and development. Thus, the longer poverty persists, the worse child outcomes become (Luthar, 1999; Smith, Brooks-Gunn, & Klebanov, 1996).

As families continue to live in poverty, maternal mental health decreases along with optimal maternal-child interaction, both of which, in turn, negatively influence children's development (Belle, 1984; Chase-Lansdale & Pittman, 2002). Young children's development is of particular concern, as there is increasing evidence that early childhood (0 – 6 years of age) health and development are crucial to life-long health and well-being (Federal, Provincial and Territorial Advisory Committee on Population Health, 1994; Frank, 1995; Hertzman & Wiens, 1996; Jefferis, Power, & Hertzman, 2002; National Forum on Health, 1997).

Specifically, the relationship between poverty and young children's cognitive development is of concern. The long-term consequences of delayed cognitive development in the pre-school years (Miller, 1998; National Council of Welfare, 2001a) include poor school achievement (Duncan & Brooks-Gunn, 1997; Miller, 1998), grade retention, assignment to special education classes, learning disabilities, developmental delays, low intelligence quotient (IQ) scores, and low verbal ability (Brooks-Gunn & Duncan, 1997). Delayed cognitive development ultimately limits future educational opportunities and employment prospects. Currently, many worthwhile job opportunities are limited to those with post-secondary education, and so consequences of delayed cognitive development can be far-reaching and have long-term consequences for individuals' employment and even for society (Chase-Lansdale & Brooks-Gunn, 1995; National Council of Welfare, 2001a).

Consequences of Poverty for Society

Epidemiological studies show that with increased income inequality, or relative poverty, disparities in health increase (Keating & Hertzman, 1999; National Forum on Health, 1997; Wilkinson, 1996). In addition, across countries, developed and developing, longer life expectancy is found in societies with smaller income differences between the rich and the poor (Wilkinson, 1996). It seems that with inequality there are higher rates of disease, which increases the costs of healthcare. Further, it appears that, with increasing disparity, early mortality increases, which subsequently costs society in terms of lost participation and contribution. Income inequality is also associated with increases in crime and violence rates (Wilkinson, 1996), which increase spending in the criminal justice system. As a result, inequality appears expensive for society.

An additional societal cost of poverty results from incomplete high school by considerable percentages of adolescents. Twice as many poor teens fail to complete high school as non-poor teens (Ross & Roberts, 1999). Dropping out of high school is estimated to cost $4 billion annually due to "lost income tax revenue and the cost of providing government assistance during unemployment" (National Council of Welfare, 2001a, p. 10). The societal costs of poor children's cognitive developmental delays include financial costs in the areas of health care, social assistance, criminal justice, special education, and lost productivity (Frank, 1995; National Forum on Health, 1997).

Unfortunately cognitive developmental delays contribute to the perpetuation of poverty across generations.

While numerous research studies have demonstrated the negative effect that poverty has on children's well-being (Chase-Lansdale & Brooks-Gunn, 1995; Duncan & Brooks-Gunn, 1997; Huston, 1991; Luthar, 1999), little research has examined the "size and strength of the pathways through which income might influence child health and development" (Brooks-Gunn & Duncan, 1997, p.64). In addition, Canadian research has only begun to examine the effects of poverty on young children's cognitive development (Williamson, Salkie, & Fast, 2002). In fact, in Canada the extent of poverty's influence on young children, 0-3 years of age, is not known. Furthermore, little is known about the effects of maternal depressive symptoms on maternal-child interaction and young children's cognitive development, and the effects of maternal-child interaction on young children's cognitive development in a Canadian context. Thus, to address these gaps, this study examined the relationships among level of family income/depth of poverty, maternal depressive symptoms, maternal-child interaction, and cognitive development of young children living in impoverished families in Edmonton. Maternal education, child age, and child gender, known to influence these relationships, were also considered.

Delimitations of the Study

While poverty affects children of all ages, this study focused on children less than 3 years of age, as this age group has been studied far less often than older children, especially in terms of cognitive development (Brady-Smith, Brooks-Gunn, Waldfogel, & Fauth, 2001). Children 3 years of age and younger are referred to here as young children.

Child development literature indicates that income affects cognitive development more strongly than emotional health, and so it can be speculated that cognitive development outcomes will more readily show effects of low income than behavioural or emotional developmental outcomes (Brooks-Gunn & Duncan, 1997; Brooks-Gunn, Duncan & Britto, 1999; Huston, 1991); thus, cognitive development was chosen as a child development outcome.

Maternal depressive symptoms and maternal-child interaction are focused on instead of parental depression and parent-child interaction. The focus on women is appropriate as they have both higher rates of poverty and higher rates of depression than men (CCSD, 2002; Ingram, Miranda, & Segal, 1998). In particular, all Canadian women over 18 years of age have higher rates of poverty than men (CCSD, 2002). In addition, a 2:1 female-to-male ratio has been estimated for the incidence of depression (Ingram et al., 1998). Furthermore, mothers in poverty have been found to experience increased rates of depressive symptoms (Coiro, 2001). Although fathers have much to contribute to their children's development, they were not included in the study since mothers are typically the main caregivers, even in two-parent families (Ross & Roberts, 1999).

Chapter 2 is devoted to a discussion of the theoretical framework that guided this study, and relevant literature is reviewed in Chapter 3. Chapter 4 presents the methods that were used to test the conceptual hypotheses and the results are presented in Chapter 5. Finally, key findings and their implications for child development, health promotion, policy, and future research are discussed in Chapter 6.

CHAPTER 2: THEORETICAL FRAMEWORK

Bronfenbrenner's Human Ecology Theory

This study was framed broadly by Bronfenbrenner's (1993) human ecology theory. Bronfenbrenner (1993) espoused that all aspects of the surrounding physical, social, institutional, and cultural environments influence individuals; therefore, these influences must be considered when studying the effects of poverty on mothers and young children. More specifically, ecological models (Belsky, 1984; Chase-Lansdale & Pittman, 2002; Conger et al., 1992; McLoyd, 1990) and more recent research on the mother-child microsystem were drawn upon to create the model (see p.18) tested in this thesis.

Bronfenbrenner (1993) described the surrounding environment as "a system of nested, interdependent, dynamic structures ranging from the proximal, consisting of immediate face-to-face settings, to the most distal, comprising broader social contexts such as classes and cultures. These constitute nested systems [which are] also conceived [of] as interdependent" (p. 4.). Thus, changes, for example, in the social environment can create implications for an individual's immediate environment.

The systems described by Bronfenbrenner (1993) were derived from Systems Theory; therefore, the theories share similar tenets. For example, they share the main tenet that reality is made up of sub-systems of all living systems, which create a network of relationships. Both theories allow an individual to shift back and forth between system levels to envision different layers of reality, which can only be fully understood when examined within the context of the larger whole by using contextual thinking (Capra, 1996). The four systems will be described following the main tenets of Bronfenbrenner's human ecology theory.

Main Tenets

A main tenet of human ecology theory is reciprocal determinism, which describes the dynamic interaction between the individual and the environment (Bronfenbrenner, 1993). The environment surrounding an individual continually influences his/her choices, lifestyle, and behaviour; similarly, the individual also continually influences the environment through choices, lifestyle, and behaviour (Green, Richard, & Potvin, 1996). These 'bi-directional influences' ought to be taken into consideration when examining the influence of the environment on the individual, which in this study, is represented by the relationships among poverty, maternal depressive symptoms, maternal-child interaction, and young children's cognitive development.

Brofenbrenner (1993) asserted that proximal influences surrounding the child are most crucial to his/her development, which influenced my decision to focus on the microsystem. When the most proximal influences on the developing child are considered, the prominence of the main caregiver becomes apparent. Since proximal influences are able to exert greater influence on the development of children than those less proximal, maternal-child interaction was given priority over children's interactions with other adults (Bronfenbrenner, 1993).

Environmental specificity, another tenet of human ecology theory, purports that individuals behave and develop differently depending upon the influences of varied environments (Bronfenbrenner, 1993). Depending upon the quality of the environment, diverse outcomes may be observed (Shonkoff & Marshall, 1990; Wade et al., 1999). Impoverished environments, by their very nature, are perceived as negative, deficient environments. Thus, if it is true that an environment has the ability to influence individuals based upon its specific characteristics, negative outcomes are expected. Neural sculpting and biological embedding, described next, provide insight into how proximal factors have greater influence on children's development than distal factors, and how various environments specify different developmental outcomes.

Neural Sculpting and Biological Embedding

Neural sculpting is defined as the shaping of networks and brain patterns (Keating & Hertzman, 1999). Therefore, neural sculpting is thought to have far-reaching effects on the brain-behaviour system, the central processes in the sensori-motor cortex, the neuro-endocrine system, and the neuro-immune system. The neuro-endocrine system affects hormonal and emotional functioning and the neuro-immune system affects disease resistance and ability to recover from injury and trauma (Keating & Hertzman, 1999).

Along with neural sculpting, biological embedding occurs when "systematic differences in psychosocial/material circumstances [for example, impoverished environments lacking material resources and/or lacking optimal interactions with mother], from conception onward, embed themselves in human biology such that the characteristics of gradients in developmental health can be accounted for" (Keating & Hertzman, 1999, p.11). Critical periods are thought to exist when certain experiences, such as interactions between mother and child, are encoded by biological embedding into the neural system. Shonkoff and Marshall (1990) stated that, "the biology of neuromaturation has been shown to be controlled by genetic mechanisms whose timing is regulated precisely and whose unfolding is sensitive to a variety of environmental influences" (p. 35). Some biological systems have very specific critical periods, in which a missed environmental influence or stimulus results in lack of a particular function forming. If a particular function is not developed properly it may emerge as a disease process (Keating & Hertzman, 1999). Both neural sculpting and biological embedding validate the perceived importance that early childhood experiences have for life-long individual functioning. Furthermore, these processes also align with "current research [that] shows that children's development is shaped by a complex interaction of genetic and environmental influences" (Chase-Lansdale, Coley, Loham, & Pittman, 2002, p.171). Early childhood experiences within the home environment, such as maternal-child interaction, contribute to neural sculpting and biological embedding.

Brofenbrenner (1993) described four systems from the most proximal to the most distal. These systems include the microsystem, the mesosystem, the exosystem, and the macrosystem, which are described next.

Four Systems

The Microsystem

The microsystem is the most proximal system, wherein the individual lives and develops, and where interactions take place among family members, peers, and neighbors (Bronfenbrenner, 1993). The environmental conditions within the microsystem begin to influence individuals pre-natally (Wong, 1995) and continue to do so over the lifespan (Hertzman, 1998). The focus of this study is on mothers and children within impoverished microsystems. Of particular interest is child development as it unfolds following the child's birth, when the child's own independent biological regulation and interactions within the microsystem begin to mold the individual (Shonkoff & Marshall, 1990).

The Mesosystem

The mesosystem, one system outwards from the microsystem, is described by Bronfenbrenner (1993) as a representation of the relations between microsystems or connections between contexts. For example, a child's mesosystem may include the interaction between the home and daycare center microsystems. These purported connections comprising the mesosystem, point to the importance of, for example, the interaction between the work microsystem and the home microsystem. To illustrate, earnings from the work microsystem appear in the home microsystem in the form of available resources. The interactions between microsystems are important to consider when examining maternal depressive symptoms.

The Exosystem

The exosystem has been described by Bronfenbrenner (1993) as "the linkages and processes taking place between two or more settings, at least one of which does not contain the developing person, but in which events occur that indirectly influence processes within the immediate setting in which the developing person lives" (p. 24). For example, in the mid-1990s, provincial policy-makers began to implement changes to social assistance programs with the intent of creating financially self-sufficient individuals and families (Gorlick & Brethour, 2001). The new policies required individuals to move from welfare to work by looking for work, attending life skills or job training programs, or working in government subsidized job placements, hence the name "welfare-to-work" to describe such programs' government policies (Gorlick & Brethour, 2001). In exchange for social assistance support, welfare recipients in Alberta are required to be employed or participate in welfare-to-work programs once their youngest child is six months of age. In essence, welfare benefits are no longer considered to be an entitlement (Gorlick & Brethour, 2001).

The welfare policy has meant that increased numbers of families secure their income from the labour market, while fewer people qualify for welfare (Cohen & Petten, 1997). Low-income earners are offered a government supplement to earnings (Gorlick & Brethour, 2001). Families in poverty may be categorized according to their source of family income: (1) the working poor represent families that secure their income strictly from low wages; (2) the mixed-income poor represent families with members that are either working and receiving supplements to earnings, or are involved in welfare-to-work programs and receive part of their income from employment and part from government assistance; and (3) the welfare poor represent families exempt from participating in welfare-to-work activities because of care-giving responsibilities, illness, and/or disability who receive welfare (Gorlick & Brethour, 2001). There has been a dramatic increase in the number of mixed-income poor due to welfare reform.

Williamson et al. (2002) stated that between 1994 and 1998 federal and provincial governments succeeded in increasing the number of working and mixed-income poor, but the depth of poverty for these families remained constant. Thus it appears that welfare reform has not changed the depth of poverty for families, or the fact that many families (12.4% in Canada) still live in poverty (Brooks-Gunn & Duncan, 1997; CCSD, 2002; Chase-Lansdale & Brooks-Gunn, 1995; United Nations, 2002; Williamson et al., 2002).

A recent literature review found limited research examining family outcomes post-welfare reform (Brady-Smith et al., 2001). In Canada and elsewhere, studies have examined the effects of experimental welfare programs (Morris, Huston, Duncan, Crosby, & Bos, 2001; Morris & Michalopoulous, 2000; Zaslow, McGroder, & Moore, 2000; Zaslow et al., 2002). In addition, all of these welfare evaluations have focused on children over 3 years of age; hence, there is little knowledge of how young children and their mothers are faring post-welfare reform (Morris et al., 2001; Morris & Michalopoulous, 2000; Zaslow et al, 2002). Williamson et al. (2002) recently analysed the 1994 and 1998 cycles of the National Longitudinal Survey of Children. This recent study does provide some insights into Canadian family and child outcomes post-welfare reform, which will be discussed further in later chapters. The current study's findings provide some indication of how mothers and their young children are faring within the context of welfare reform in Alberta.

Other aspects of impoverished families' exosystems include minimum wage policy and labour market conditions. Individuals who move from welfare to work usually find employment that pays a minimum wage and does not offer benefits (Heymann & Earle, 1998). Consequently, minimum wage employment maintains the depth of poverty experienced by families. Currently, the minimum wage in Alberta is $5.90, and it is impossible for a family with one minimum wage earner to reach the poverty line (see p. 23 for a discussion of the poverty line) by working 40 hours a week. If a single parent with one child worked full-time at $5.90 for one year, the annual family income would be $12,272. This is about half of $22,961, which is the current Statistics Canada Low-Income Cutoff for a family of two (Statistics Canada, 1999). Since the current minimum wage is not a 'living wage', families have to 'make do' with less, especially as inflation increases the cost of living (Cohen & Petten, 1997; Edmonton Social Planning Council, 2000).

Currently, the labour market has created the need for a 'just-in-time' workforce, characterized by short-term and contract work that provides less job security. The irregular shifts demanded by the 'just-in-time' workforce require flexibility and the acceptance of variable wages without benefits, all of which makes the plight of a low-income earner even more challenging (Burman, 1996; Cohen & Petten, 1997).

Consequently, employment, even when full-time, does not guarantee immunity from poverty. In the end, the goal of welfare reform – to make families financially self-sufficient (Gorlick & Brethour, 2001) – may in many cases not be met for families who have moved from welfare to minimum wage employment. On the contrary, instead of poor families relying on social assistance from the government, the families may rely on local community organizations to meet their basic needs (e.g. food and clothing banks) (Simons, 2001).

The Macrosystem

The macrosystem, the most distal system from the family, comprises broad ideological, demographic, and institutional patterns of a culture or sub-culture (e.g. economic, social, or political systems), which are transmitted from one generation to the next (Bronfenbrenner, 1986; Garbarino, 1990; Santrock, 1995). The macrosystem provides a framework within which the nested systems fit, as well as a backdrop against which this study took place. For instance, our political system being largely guided by neo-liberal policies with neo-conservative elements upholds a market economy tradition

(Raphael, 2000a) that allows unemployment. As a consequence, "whenever the economy heats up and employs more people, offering the possibility of raising inflation, the Bank of Canada tightens the money supply and raises interest rates slowing job creation" (Burman, 1996, p.11; Cohen & Petten, 1997). Hence, a certain amount of unemployment is thought to actually 'help' the market economy (Burman, 1996; Cohen & Petten, 1997). Unemployment rates and low wages are two examples of how the macro and exosystem significantly affect families' level of income and thus the level of poverty.

Summary and Conclusions

Poverty is a socioeconomic condition rooted in the macrosystem and exosystem, as McLoyd (1990) asserts, "structural changes and current economic policies reflect a serious lack of will to eradicate poverty" (p. 337). As such, societies determine the steepness of their income gradients by their broad ideological orientation (macrosystem), which influences how society functions or exists (exosystem) (Bronfenbrenner, 1993; Keating & Hertzman, 1999). To illustrate, societies determine the size of their income gap or level of relative poverty by their economic, social, and political systems. For example, Sweden's macrosystem/exosystem supports an egalitarian society, which translates into high levels of income equality and a shallow income gradient (Keating & Hertzman, 1999). In contrast, Canada's broad ideological, demographic, and institutional patterns (e.g. economic, social, or political systems) operate from an individualistic orientation. Individualism, striving towards self-sufficiency and independence, results in less income equality and a steeper income gradient for Canada than is true for Sweden (Raphael, 2000a).

The steepness of Canada's income gradient influences variations in social status and income, which translate into differences in the quality of social and physical factors within children's microsystems, ultimately affecting children's development (Keating & Hertzman, 1999). In this way, environmental specificity, or the quality of social and physical factors with microsystems, stemming from the macrosystem and exosystem create diverse child development outcomes (Shonkoff & Marshall, 1990). Steep income gradients and low levels of human development occur together and Keating and Hertzman (1999) suggest that they point to weaknesses in a society.

It is also important to acknowledge that there are resilient individuals who have overcome the harsh circumstances that characterize poverty (Drummond, Kysela, McDonald, Alexander, & Fleming, 1991; Werner & Smith, 1992, 2001). Nevertheless, it is still optimal to promote healthy development earlier in life than to re-direct development later on in life (Bayley, 1993; Keating & Hertzman, 1999).

In summary, Bronfenbrenner's (1993) human ecology theory encompasses a wide-scale systems view of influences, including intra-personal factors, interpersonal processes within primary groups, institutional factors, community factors, and public policy that informed this study. Unfortunately, Bronfenbrenner's theory does have some short-comings, discussed next.

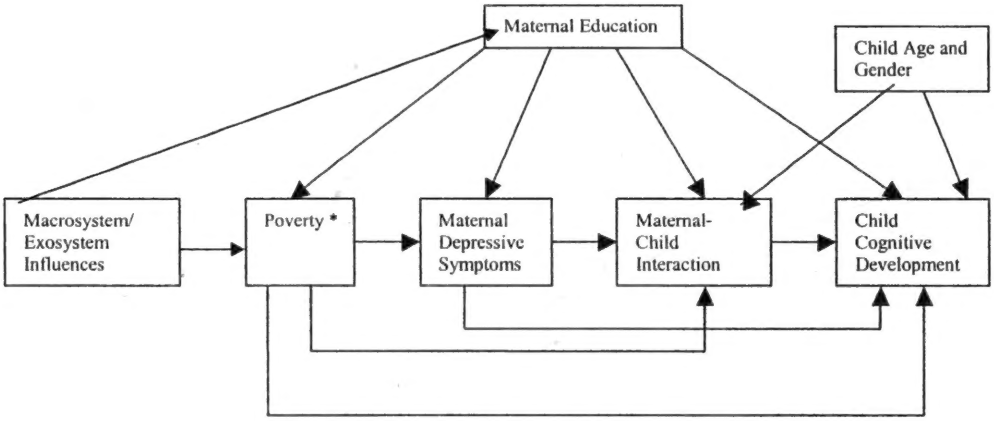
Limitations of Bronfenbrenner's Human Ecology Theory

Bronfenbrenner's human ecology theory is complex and has "not been worked out in great detail" (Green et al., 1996, p.27). However, a certain level of theoretical complexity is warranted to match the complexity of human phenomena (Bronfenbrenner, 1993). The inherent difficulty of capturing all system and sub-system influences upon each other places the researcher at risk of creating an artificial reality, as may happen when reality's complexity is reduced to a researchable level (Green et al., 1996). The complexity of human ecology theory prompts some to abandon the theory as it becomes too intimidating or impractical to use (Green et al., 1996) when the whole context surrounding families is taken into consideration when studying family outcomes. As a result of this identified limitation, other models, closely linked to human ecology theory, were drawn upon to create the model tested in this thesis.

Model

The purpose of creating a new model (Figure 1) was to depict the way in which the *current study's variables are related*, based upon recent knowledge. Four ecological models were drawn upon: Belsky's (1984) model, McLoyd's (1990) model, Conger et al.'s (1992) model, and Chase-Lansdale and Pittman's (2002) model. These models were selected because each one describes relationships depicting the social aspects within children's microsystems, and some of the models include poverty within these relationships. The model I developed from these four models will provide a foundation for the remainder of the thesis.

Figure 1. The Model


Maternal Education
Child Age and Gender
Macrosystem/ Exosystem Influences
Poverty *
Maternal Depressive Symptoms
Maternal-Child Interaction
Child Cognitive Development

** Poverty= level of family income/depth of poverty*

Assumptions Borrowed From Belsky's Model

Consistent with Belsky's (1984) ecological model, the new model assumes that the parent and child are influenced by the broad social context that surrounds them. The assumption that parenting is multiply determined is included in the new model. Specifically, the new model assumes parents' personal psychological resources influence parental behaviour (Belsky, 1984). In addition, poverty (level of family income/depth of poverty) is assumed to represent part of the broad social context surrounding the parent-child relationship, which influences parenting. Next, child age and gender represent child characteristics assumed to influence parenting and child development. The new model also assumes that parenting "predicts various aspects of child development" (Belsky, 1984; Van Bakel & Risken-Walraven, 2002, p. 259).

Assumptions Borrowed From Conger et al.'s Model

Similar to Conger et al.'s (1992) assumption, the new model assumes that level of family income/depth of poverty influences maternal depressive symptomology. In addition, "depressed mood . . . [is] expected to provide [one of] the principal mechanism[s] through which financial problems . . . influence . . . parental behaviors" (Conger et al., 1992, p. 528). Further, the new model also assumes that parenting is one of the main ways that family economic circumstances affect children's outcomes.

Assumptions Borrowed From McLoyd's Model

Poverty, described as "chronic conditions outside personal control" (McLoyd, 1990, p.318), is reflected in the new model with the inclusion of a macrosystem/ exosystem influence, representing societal influence. Next, psychological distress, represented by maternal depressive symptoms in the new model, is viewed as a "normal and situational response to economic hardship" (McLoyd, 1990, p.313), which reduces the ability for optimal parenting, and mediates the relationship between poverty and child developmental outcomes. Thus, the new model also assumes that the "more emotionally distressed [the parent, the more] . . . parenting capacity decreases" (McLoyd, 1990, p.322); in other words, impoverished parents are assumed to have less than optimal parenting interactions with their children. The new model also assumes that child characteristics influence parenting; however, child age and gender have been used instead of temperament and physical appearance as in McLoyd's model (McLoyd, 1990).

Assumptions Borrowed From Chase-Lansdale and Pittman's Model

Similar to Chase-Lansdale and Pittman's (2002) model, the new model assumes that poverty influences parenting both directly and indirectly. Second, the new model assumes that stressors related to economic hardship influence parent mental health, which in turn influences parenting (Chase-Lansdale & Pittman, 2002). The new model assumes maternal education and maternal depression influence parenting. Instead of using cognitive ability directly, the proxy of maternal education is assumed to influence parenting. Parenting, represented as maternal-child interaction in the new model, is assumed to influence child development (Chase-Lansdale & Pittman, 2002) and children's characteristics, in this study child age and gender, are assumed to influence parenting and child development.

Other Assumptions

Despite the fact that four different models were drawn upon in this study, recent studies have provided more assumptions that ought to be represented in the new model. For instance, none of the models depict a direct relationship between poverty (level of family income/depth of poverty) and child development, which has been shown in numerous recent studies (for example Klebanov, Brooks-Gunn, McCarton, & McCormick, 1998; Miller, 1998; for more see Chapter 3). Thus poverty is assumed to influence child cognitive development. Nonetheless, it would be presumptuous to conclude that all of the most important variables in an impoverished environment have been included in any model.

Further, maternal education is widely known to influence level of family income and maternal depressive symptoms (for example Jackson & Huang, 1998; for more see Chapter 3). Literature has also shown that maternal depressive symptoms influence children's cognitive development (for example Jackson, Brooks-Gunn, Huang, & Glassman, 2000; Lyons-Ruth, Zoll, Connell, & Grunebaum, 1986; for more see Chapter 3). Finally, maternal education, a strongly correlated concept of maternal intelligence, is thought to influence children's cognitive development (Bayley, 1993; Brooks-Gunn et al., 1999; Murray, 1992; Petterson & Albers, 2001).

The new model summarizes this study's assumptions regarding the *relationships among variables*, and it will be referred to as 'the model' throughout the remainder of the thesis. Further, the model [rooted in Bronfenbrenner's (1993) human ecology theory] frames the study, the literature reviewed, the hypotheses, the methods, the results, and finally, the discussion.

CHAPTER 3: LITERATURE REVIEW

As discussed earlier, according to Bronfenbrenner's human ecology theory, the environment influences the family. Bronfenbrenner placed importance on the most immediate environment, the microsystem, and this guided the choice of research reviewed here. Preference was given to studies examining specific variables applicable to the microsystem, namely: poverty, maternal depressive symptoms, maternal-child interaction, maternal education, child age, child gender, and young children's cognitive development. Moving outwards from the family environment, other environments, such as the exosystem, are also assumed to affect the family. This review examines literature pertaining to the influence of poverty on mothers and young children in terms of maternal depressive symptoms, maternal-child interaction, and child cognitive development.

First, the influence of poverty on cognitive development of young children and maternal depressive symptoms is addressed. Next, literature focusing on the processes within the microsystem is examined in three sections: (1) the influence of maternal depressive symptoms on young children's cognitive development, (2) the influence of maternal depressive symptoms on maternal-child interaction and (3) the influence of maternal-child interaction on young children's cognitive development. Finally, the influence of poverty on maternal-child interaction is treated. The chapter concludes with a summary of confounding variables, the literature reviewed, and its gaps.

Delimitations of the Literature Review

A plethora of research exists on children's development, so the findings will be discussed in terms of children less than 3 years of age only – although some of the studies include children of a range of ages. Relevant Canadian studies are limited in number, and will be highlighted throughout the chapter.

There are many aspects of low-income contexts that threaten families' well-being and children's development, including lack of "proper nutrition, adequate living conditions, and good maternal health" (Brooks-Gunn & Duncan, 1997; Klebanov et al., 1998, p. 1421; Ross et al., 1996). However, the model used in this study places importance on the social interactions within the family environment; thus, the literature reviewed mainly focuses on the social aspects of the low-income family context.

Poverty And Young Children's Cognitive Development

Poverty

Whether to draw the poverty line relative to others' income or as absolute lack of basic needs is a debatable topic in many countries, and Canada is no exception. Poverty and low income will be used interchangeably within this thesis, and are defined as the "deprivation of economic resources that are required for dignified participation in society" (Williamson & Reutter, 1999, p. 357) due to individuals being "substantially worse-off [financially] than the average" (Statistics Canada, 1999, p. 6).

In Canada, poverty has been commonly measured by the Statistics Canada Low Income Cut-Offs (LICOs); therefore, this study also used the LICOs as a measure of the poverty line. Most of the studies reviewed operationalize poverty as an income-to-needs ratio using the LICOs or the U.S. Federal poverty line. Income-to-needs ratios are thought to be an acceptable and accurate means to determine the influence of income on family outcomes (Jackson et al., 2000); therefore, income-to-needs ratio was included as a measure of poverty in this study. Some studies only refer to family income as being either above or below the poverty line (e.g. Bacharach & Baumeister, 1998; Garcia-Coll, Buckner, Brooks, Weinreb, & Bassuk, 1998; Klebanov et al., 1998; Liaw & Brooks-Gunn, 1994; Smith et al., 1997). This study, in addition to providing an income-to-needs ratio, provides the actual level of family income, as it has been rarely used in studies.

Statistics Canada (1999) states that the LICOs do not have official poverty line status, but they "identify those who are substantially worse-off than the average" (p. 6). The National Council of Welfare and other social policy groups regard the LICOs as the poverty line and use the terms 'poor' and 'low-income' interchangeably. Statistics Canada has been using the LICOs in published reports for the past twenty-five years and states that as long as the LICOs represent a group's "considered opinion of how poverty should be defined in Canada, we have no quarrel with them: all of us are free to have our own views" (Fellegi, 2002, p.1). Williamson (1995) outlined various measures of poverty, many based upon the assumption that poverty is relative, and as such, rooted in income inequality. Utilizing a measure of poverty that portrays income inequality versus complete lack of basic provisions seems especially suitable for use in a developed country that for the most part has a high standard of living. The LICOs, one measure of poverty, have been defined in the following way:

> "The LICOs are income levels at which families, differentiated by family size and the population of the community within which they live, spend 20% more on basic needs than the average amount spent by Canadian families. Basic needs are identified as food, shelter, and clothing. The average proportion of income currently believed to be spent on basic needs has been estimated by Statistics Canada to be 35%. . .Thus, with the addition of 20 percentage points, the poverty standard is set at 55%. . . In other words, families whose expenditures on necessities exceed 55% of their gross income, are living below the LICOs" (CCSD, 2001c; Williamson, 1995, p. 41).

The U.S. poverty line, originally a measure of income inadequacy, was based upon an economy food plan. This designated food plan was the cheapest of four food plans, intended for temporary or emergency use only, when family funds were low (Fisher, 1997). Similar to the LICOs, the U.S. poverty line includes various thresholds based upon family size. Although the U.S. poverty lines have changed to reflect price changes over the years, changes in standard of living are not taken into consideration, which reflects an absolute versus relative conceptualization of poverty (Fisher, 1997).

Cognitive Development

Cognitive development of young children has been described as "information processing, memory, discrimination, or attention" (Bayley, 1993, p.6). Cognitive development more generally includes "any and all psychological processes that function to give an organism knowledge about its environment, and its situation within the environment" (Reed, 1993, p.46). These definitions specify the role that cognitive development plays in enabling children to interact with their environment. Further, cognitive development represents that which society deems as integral to its maintenance, reproduction, and transformation (Meacham, 1993).

Poverty and the Cognitive Development of Young Children

The influence of poverty on young children's cognitive development is thought to be both direct and indirect, as depicted by the model. That is, some studies have found a direct relationship between income and development, while others have found that "economic circumstances may have effects on children's development through their effect on financial strain and, in turn, in parenting quality" (Conger et al., 1992; Jackson et al., 2000, p. 1419; McLoyd, 1990); the indirect pathway also includes "[maternal] psychological well-being that mediates between economic hardship and child developmental outcomes" (Conger et al., 1992; Jackson et al., 2000, p. 140; McLoyd, 1990). The indirect pathway begins with the influence of poverty on maternal depressive symptoms, which in turn influence maternal-child interaction, which in turn influences child cognitive development. The direct relationship between poverty and cognitive development is presented next and the indirect relationships will be presented afterwards.

Most studies indicate that low-income contexts negatively affect young children's cognitive development (Bacharach & Baumeister, 1998; Chase-Lansdale et al., 2002; Chase-Lansdale & Pittman, 2002; Klebanov et al., 1998; Landry, Smith, Miller-Loncar & Swank, 1997; Liaw & Brooks-Gunn, 1994; Miller, 1998; Murray, 1992; National Institute of Child Health and Human Development [NICHD], 1998; Petterson & Albers, 2001; Smith et al., 1997). These findings are strengthened by the fact that despite the use of various sample sizes (n = 51 – 13, 000) and various measures of cognitive development (e.g. Bayley Scales of Infant Development Mental Development Index, Denver Developmental Screen Test, Motor and Social Development Scale, Stanford Binet Intelligence Scale, and the Woodcock-Johnson), the majority of the findings support the same relationship.

Smith et al. (1997) found that a one-unit increase in income-to-needs ratio translated into a 3.7-point increase on the Mental Development Index scale. This effect appeared as early as two years of age in their study. Similarly, Miller (1998) found that

> "the percentage of children who were classified as abnormal according to the [Denver Developmental Screen Test] DDST decreases markedly with increasing income. Over 9% of children from very poor families were classified abnormal, compared with 7.6% of those who were less poor, 4.8% of those who were near poor, and just over 2% of those who were above near poor" (p. 141).

Both of these studies indicate a dose-response relationship between income and child cognitive development wherein, the lower the level of income the lower the level of cognitive development. Petterson and Albers (2001) found that persistent/long-term poverty predicted worse outcomes than short-term poverty, which indicates that the longer the duration of poverty, the worse the cognitive delay.

A small number of studies did not find low cognitive development scores for young children living in poverty (Beckwith & Rodning, 1996; Wallace, Roberts, & Lodder, 1998; Williamson et al., 2002). Wallace et al. (1998) did not find lower cognitive scores for children living below the poverty line as compared to those living above the poverty line; however, the sample was drawn from community-based child care programs, which have been known to positively influence children's cognitive development (Ramey, Farran, & Campbell, 1979). Beckwith and Rodning (1996) found no correlation between cognitive development and demographic factors in a sample of 51 dyads; however, their findings were attributed to a restricted low socioeconomic range.

In a sample of 218 impoverished children, Garcia-Coll et al. (1998) found that only one quarter had scores below the cut-off of 85, indicating possible developmental delay, while 75% had scores within the normal range of 85-114. The researchers speculated that if they had been able to use the revised Bayley Scale of Infant Development (BSID) (the revised BSID Second Edition [BSID II] was published during the course of the research study), the number of below average scores would have increased in the sample. Providing support for the researchers' hypothesis, a comparison between scores using the old BSID and the revised BSID II produced a 12-point decrease from old to new (Bayley, 1993; Garcia-Coll et al., 1998). The difference was attributed to the revised norms of the BSID II that more accurately reflect the current developmental status of children (Garcia-Coll et al., 1998).

While Smith et al. (1997) found that poverty was negatively associated with children's cognitive development as early as 2 years, they did not find the same relationship for children who were only 1 year of age. The researchers hypothesized that either the effects of income are very small at this age or that the cognitive development measure is not reliable until after 1 year of age when verbal, quantitative, and reasoning abilities may be tapped. Alternatively, it may be that the influence of early disadvantage increases over time. Nonetheless, the results of the study may be spurious.

Nature Versus Nurture

It may be that measurement of infant cognitive development in children younger than 2 years of age taps 'simple cognition' as compared to 'intelligence' of older children (Bayley, 1993). To illustrate, measures of infant cognition tap into bio-physical correlates of cognition; whereas, measures of cognition for children 2-3 years of age tap actual cognitive abilities. The difference in measures may be attributed to the sensori-motor stage, which extends from birth to 2 years of age, characterized by the use of action to express thought (Cicchetti & Wagner, 1990; McShane, 1991). Some psychologists espouse that sensori-motor development is determined to a greater extent by genetics (nature) than experience (nurture) (Cicchetti & Wagner, 1990). The aforementioned findings of Smith et al. (1997) may then be explained by the 'maturation hypothesis', which emphasizes children's bio-physical development in the first year of life, for example, reaching for objects or turning to voice. Maturationists would argue that low-income is not likely to affect this normal trajectory of physical development and growth processes, which are reliant on genetics all human beings are endowed with; therefore, they suggest that the cognitive development of children less 2 years of age is not likely to be affected by low income (Cicchetti & Wagner, 1990).

It is also important to note that the predictive validity of infant cognitive development instruments is low, which may be due to the maturation hypothesis (Cicchetti & Wagner,1990). If this is the case, 'simple cognition' (0-2 years), which taps sensori-motor ability, and 'intelligence' (over 2 years), which taps language ability, constitute two different trajectories; thus, one would not be expected to predict the other very well. Cicchetti and Wagner (1990) caution that even if the predictive validity is low, infant development tests are not useless: on the contrary, they inform us of how infants are faring compared to their peers.

Genes and Cognitive Development

Another way genetics are thought to influence the cognitive development of children is via transmission of genes for intelligence from parents to offspring. Maternal education, closely associated with maternal intelligence, is also thought to influence the development of cognitive ability (Liaw & Brooks-Gunn, 1994; Petterson & Albers, 2001; Van Bakel & Riksen-Walraven, 2002; Wallace et al., 1998). However, maternal education ought not be equated with maternal intelligence for reasons that are beyond the scope of this thesis.

Children's age and gender, two genetically determined characteristics, have also been found to influence children's development, another example of bi-directional influences (Brooks-Gunn et al., 1999; Jackson et al., 2000; Murray, Kempton, Woolgar, & Hooper, 1993; Smith et al., 1996; Smith et al., 1997). It is difficult to prove that genetics solely influence child development and we cannot currently alter genetics. It follows that other possible influences that may be altered ought to be studied, such as the environment.

Canadian Literature

A Canadian study, which used the Statistics Canada's National Longitudinal Study of Children and Youth (NLSCY), found significant differences in the cognitive development scores for young children from low, middle, and high-income families; however, in the 1998 cycle, children from high-income families had lower mean scores than both low- and middle-income groups of children (Williamson et al., 2002). This study raises questions about whether Canadian poverty environments differ from those of other countries. Studies from countries outside of Canada have found significant differences in cognitive development amongst young children of varying financial background: lower cognitive development outcomes were found for children from low-income families and higher cognitive development outcomes were found for children from higher-income families (Brooks-Gunn & Duncan, 1997). If countries outside of Canada have worse poverty environment conditions, it would make sense that Canadian outcomes might not be as negative.

Notwithstanding, cognitive development scores may have been influenced by parents' socially desirable answers, as the Williamson et al. (2002) study analyzed data from a parent-report instrument instead of data from a direct observation of children by a trained professional. Many studies that have found a negative association between poverty and cognitive development, have administered cognitive development instruments rather than relying on parent report (Bacharach & Baumeister, 1998; Klebanov et al., 1998; Landry et al., 1997; Liaw & Brooks-Gunn, 1994; NICHD, 1998; Smith et al., 1997). Alternatively, these findings may be due to the maturation hypothesis or some other unknown explanation.

However, a Canadian study (Byrne et al., 1998) that used a parent-report instrument (Minnesota Child Development Inventory of cognitive development) did find low child cognitive development scores in an impoverished sample. Single parents receiving social assistance and their children were studied. Findings revealed that 32% of the children less than 47 months of age (80% of which were less than 36 months) had cognitive developmental delays.

The literature does not specify the practical significance of low cognitive developmental scores, as none of the studies reviewed discussed the magnitude of the scores or their meaning for children. It is unclear why researchers have not discussed the practical significance of their findings. It may be that criteria for cognitive developmental delays have not been well established and therefore difficulties emerge when interpreting how findings influence children at very young ages. The low predictive validity of infant cognitive development instruments may provide further justification for the unexplained clinical significance. Statements pertaining to how children are faring in comparison to their peers may be the only interpretation possible, but in many instances even this was not addressed.

In summary, an overwhelming amount of evidence indicates that a negative relationship exists between poverty and young children's cognitive development. However, there are few studies that examine the relationship for children younger than 2 years of age.

Poverty, Maternal Depression, and Depressive Symptoms

The impoverished environment also influences mothers of young children. Poverty influences mothers by affecting their level of depressive symptoms. The relationship between poverty and maternal depressive symptoms, as illustrated by the model, will be discussed next.

Depression Described

Continuing feelings of sadness, helplessness, hopelessness, worthlessness, irritability, self-blame or guilt, disappointment, grief, and emptiness are symptoms of depression. Individuals with depression often are unable to keep up with activities of daily living such as personal care, household chores, friendships, and social activities. In addition, they can experience sudden loss of interest in activities previously enjoyed, and they tend to avoid other people (Stuart & Sundeen, 1995).

Physical symptoms of depression include sleeping more or less than normal, loss of energy, noticeable changes in appetite that may cause a significant weight gain or loss, headaches, and stomachaches. Psychological symptoms of depression include difficulty or inability concentrating or making decisions, decreased sex drive, and thoughts of death or suicide (Stuart & Sundeen, 1995). Physicians usually make a diagnosis of clinical depression when symptoms are severe, last for several weeks, and interfere with one's work and social life.

The length of time the depression lasts varies among individuals with the degree of severity of the distressing life event and the quality and quantity of support available. Clinical depression may not last long for some, although for others it does last a long time, and once a person has had a clinical depression the risk of re-occurrence increases (Stuart & Sundeen, 1995).

Poverty and Depression

People living in poverty experience economic pressure due to low-income levels, and this is thought to lead to a preoccupation with finances, resulting in frustration, anger, and general demoralization (Conger et al., 1992). Their continuous struggle with finances weakens their ability to cope with new problems and difficulties as they emerge, which results in increased vulnerability to other stressors (McLoyd, 1990). The ambiguity of future survival along with chronic conditions, frustrating situations, and negative life stressors all play a part in increasing the symptomology of depression of those living on a low income (Belle, 1994; Halpern, 1993; McLoyd, 1990). Further, McLoyd (1990) thought that, "psychological distress . . . [was] a *normative and situational response* to economic hardship" (p. 313, emphasis added). The distress appears to be a natural occurrence in response to stress for some individuals, especially when there are multiple ongoing stressors (Chase-Lansdale & Pittman, 2002; McLoyd, 1990). The ongoing nature of the stressors is thought to have a worse impact on psychological health than one-time, acute negative life-events (Belle, 1984). Not surprisingly, the causes of depression include "specific, *distressing life events*, a biochemical imbalance in the brain, psychological factors like a negative or pessimistic view of life, [and] genetics" (Canadian Mental Health Association, 1993, p.1, emphasis added; Stuart & Sundeen , 1995); thus it becomes clear that poverty can influence depressive symptoms.

One U.S. study used the Diagnostic and Statistical Manual of Mental Disorders (DSM-III-R) criteria, which provides a diagnosis of clinical depression (Lynch, Kaplan, & Shema, 1997). The longitudinal study by Lynch et al. (1997) spanned 17 years and found strong associations between economic hardship and reduced psychological functioning. Findings indicated a 'dose-response effect' of economic hardship on depression. Participants who had incidences of economic hardship were 3.27 times more likely to develop depression than those who had no economic hardship. The researchers took steps to measure reverse causation, that is depression causing economic hardship, and did not find any compelling evidence of this (Lynch et al., 1997).

Poverty and Depression in Canada

While 6% of Canadians in the general population experience depression (Beaudet, 1996), there are much higher percentages among those living in low-income contexts (Patten, 2001). A Canadian epidemiological study from Calgary, Alberta showed a 33% difference in prevalence of depression between the lowest and highest income groups. Forty-two percent of individuals living on less than $10,000 per 1-4 persons and less than $15,000 per 5 or more persons had depression. In comparison, only 9% of individuals living on $60,000 or more per 1-2 persons and $80,000 or more for 3 or more persons had depression (Patten, 2001). Patten's (2001) findings demonstrate a decrease in prevalence of major depression as income increases, which is consistent with findings from other countries (Brody et al., 1994; Bruce, Takeuchi, Leaf, 1991; Conger et al., 1992; Kessler et al., 1987a, 1987b; Lynch et al., 1997; McLoyd, Jayaratne, Ceballo & Borquez, 1994).

Depressive Symptomology

The terms depressive symptoms or depressive symptomology are used interchangeably throughout the thesis. Both terms mean symptoms of depression - *not* clinical diagnosis of depression. Most studies in this area use the Center for Epidemiological Studies Depression scale (CES-D) (Coiro, 2001; Lyons-Ruth et al., 1986; Miller, 1998; Petterson & Albers, 2001; Hall, Williams, & Greenberg, 1985), which measures signs and symptoms of depression as opposed to clinical depression. It is not a diagnostic instrument. Hence, studies that have used the CES-D cannot provide a percentage of the sample that has clinical depression, but instead they provide a continuum of depressive symptoms experienced by the sample; however, CES-D scores over the cut-off of 16 have been associated with clinical depression (Radloff, 1977). The majority of findings show that women living in low-income contexts have average CES-D scores of 15-17.8 (Coiro, 2001; Hall et al., 1985; Lyons-Ruth et al., 1986).

Mothers Living in Low-Income Contexts

The literature continually highlights depressive symptoms as a health concern for women living in poverty (Belle, 1984; Coiro, 2001; Lyons-Ruth et al., 1986), and several studies have shown that mothers in low-income contexts have a higher risk for maternal depressive symptoms than mothers from middle or high-income contexts (Coiro, 2001; Conger et al., 1992; Hall et al., 1985; Hope, Power, & Rogers, 1999; Lyons-Ruth et al., 1986; McLoyd, 1990; McLoyd et al., 1994; Miller, 1998; Petterson & Albers, 2001; Williamson et al., 2002). A Canadian study compared levels of depressive symptoms among low-income, middle-income and high-income mothers, and found that maternal depressive symptoms increased significantly as level of income decreased (Williamson et al., 2002).

Further, many researchers have found statistically significant relationships between low-income and maternal depressive symptoms controlling for education, which is known to be associated with depressive levels (Coiro, 2001; Jackson & Huang, 1998; Lyons-Ruth et al., 1986; Naerde, Tambs, Mathiesen, Dalgard, & Samuelsen, 2000; Petterson & Albers, 2001). The chronicity of poverty contributes to chronicity of maternal depressive symptomology. In a sample of low-income mothers, 52% had depressive symptoms and this percentage did not change over a 6-18 month time period – indicating a chronic depressive symptomatic state.

Finally, single mothers report more depressive symptoms than married or cohabitating mothers, likely due to increased financial hardship (Hope et al., 1999). However, social support has been found to influence maternal depressive symptoms, and so it can be speculated that the findings were due to lack of spousal social support (Belsky, 1984). A discussion regarding social support is beyond the scope of this thesis.

Two possible scenarios of low-income situations may contribute to maternal depressive symptomology. First, one study found that working poor mothers, who worked full-time and received government subsidies due to low wages, had depressive symptoms associated with their hourly wage earned and beliefs that their employment either caused harm or could possibly cause harm to their children (Jackson & Huang, 1998). The amount of income earned by employed single-mothers translates into the amount of resources available in the home. Certain resources are needed to maintain everyday life; without these stress ensues (Mullen, Gold, Belcastro, & McDermott, 1993). The level of resources at impoverished single-mothers' disposal influence stress levels and ultimately influence their depressive symptoms, as the importance of money or the "concern with lack of money and with the related problems of paying bills, finding a decent place to live, putting food on the table" have been documented to influence psychological well-being (Makosky, 1982, p.50).

This association may also be explained by the fact that minimum wage employment does not usually offer paid leave (sick or vacation) or flexibility to take time off work (Heymann & Earle, 1999). When employment does not support mothers in taking time from work to care for their children, the work environment then may become a source of stress, potentially contributing to depressive symptomology (Coiro, 2001).

Second, mothers that receive social assistance are required to interact with 'the system.' Social assistance recipients must demonstrate their need for assistance, having no other option but to ask for assistance. Once through this process, social assistance recipients may feel defined by their need for financial assistance. This stigmatization may increase stress levels, further affecting levels of depressive symptoms (Halpern, 1993). Depressive symptoms may increase when having to deal with "intrusive, disdainful caseworker[s] who [make] her feel that by seeking support she is doing something shameful" (Halpern, 1993, p. 78). Consequently, continually interacting with indifferent, unhelpful, and unempowering welfare caseworkers may be perceived as an ongoing distressing life event, which may, in turn, contribute to increased risk of depression (Cook, 2000; Stuart & Sundeen, 1995). It is therefore not surprising that interviews with 24 mothers receiving social assistance revealed negative feelings of self, low self-confidence, low self-esteem, and a lack of choice and energy – all symptoms of depression (Burge, 1999). Another study revealed that 45% of the women on social assistance had depressive diagnoses, as well as low levels of social adjustment and coping skills (Byrne et al., 1998). Belle (1984) perceived these "economic difficulties . . . [as] the root of so many of the emotional problems of low-income women" (p. 145).

Bi-Directional Influences

In many studies baseline levels of depression are unknown; therefore, it must be acknowledged that maternal depressive symptoms may influence the ability to attain income. The possibility of bi-directional influence, or reciprocal determinism, wherein the mother's level of depression influences her environment is conceded. Notwithstanding, "the mental health of low income women and minority women cannot be separated from the environment context of their lives, and these contexts are shaped in important ways by social and economic forces beyond the control of any single individual" (Belle, 1984, p.145). Maternal education may also be thought of as a bi-directional influence on the level of maternal depressive symptoms (Jackson & Huang, 1998; Jackson et al., 2000; Naerde et al., 2000); however, since maternal education is associated with income level, it could be that those with greater levels of income have received treatment, whereas those with less education and income have not, resulting in differing levels of depression.

In summary, since the low-income context appears to be full of stressors and ambiguity, in the findings from the above studies, depression and depressive symptomology appear to be a frequent consequence of poverty for mothers. The model indicates that maternal depressive symptoms influence young children's cognitive development directly and indirectly by first influencing maternal-child interaction. The direct relationship between maternal depressive symptoms and young children's cognitive development will be examined first.

Maternal Depressive Symptoms and Young Children's Cognitive Development

When characteristics of maternal depressive symptoms are placed within the child's environment, it aids in understanding how "high levels of psychological distress may lead to . . . adverse child outcomes" (Jackson et al., 2000, p.1410). The mother with depressive symptoms may not have energy to wake up in the morning and parent. Also, her symptoms of irritability, sadness, grief, helplessness, and avoidance of others may create difficulties in providing learning opportunities for the child. Children learn from observing and taking part in the activities of daily living (Sumner & Spietz, 1994), but depressive symptoms, such as inability to keep up with household chores or personal care may decrease the number of these learning activities.

The majority of studies reviewed found that maternal depressive symptoms negatively affect cognitive development in young children (Byrne et al., 1998; Liaw & Brooks-Gunn, 1994; Lyons-Ruth et al., 1986; Miller, 1998; Murray, 1992; NICHD, 1998; Petterson & Albers, 2001). Similar results were found with a variety of cognitive development measures and varying sample sizes ranging from 56 to almost 8,000. Further, the relationship between maternal depressive symptoms and children's cognitive development was found regardless of income (Liaw & Brooks-Gunn, 1994; Miller, 1998; Murray, 1992; NICHD, 1998; Petterson & Albers, 2001).

One contrasting Canadian study did not find any association between maternal depressive symptoms and child cognitive development for children 3 years of age and younger (Williamson et al., 2002). Nonetheless, maternal depressive symptom levels were low, suggesting that perhaps only scores above the cut-off indicating depressive symptomology are essential for an association to exist. Furthermore, an abbreviated form of the CES-D, without established reliability, was used to measure depressive symptoms and this may have influenced the reliability of the scores found.

A smaller study from Eastern Canada had mixed findings (Byrne et al., 1998). The study found that children 16-35 months of age, whose mothers were depressed according to a diagnostic instrument, were 1.27 times more likely to have cognitive developmental delays compared to children of well mothers. In contrast, the association between maternal depression and cognitive developmental delay among infants less than

15 months of age was not significant. The non-significant finding suggests that the length of exposure to depressive symptoms may be a key factor in the association (Byrne et al., 1998), or again, the findings may be due to the 'maturation hypothesis'.

In summary, the majority of the studies reviewed did not examine the effects of maternal depressive symptoms on children younger than 2 years of age (Liaw & Brooks-Gunn, 1994; Miller, 1998; NICHD, 1998; Petterson & Albers, 2001). Nonetheless, most studies reported that maternal depressive symptoms negatively affect cognitive development in young children. Moving further to the right in the model, the variable maternal-child interaction will be described next.

Maternal-child Interaction

The interactions that take place between mother and child within the microsystem are complex, multi-faceted, and personal (Chase-Lansdale & Pittman, 2002; Sumner & Spietz, 1994). The quality of maternal-child interaction is assessed on several dimensions. Contingency, attunement, synchrony, reciprocity, and mutuality are characteristics of optimal interactions between parent and child (Sumner & Spietz, 1994).

Contingent interactions are in a word, responsive. When a mother responds to her child's behavioural expressions of needs and desires, called cues, immediately and consistently, the response is deemed contingent. The child must also be responsive, as he/she must give clear cues and respond to the mother, in order for a contingent interaction to occur (Chase-Lansdale & Pittman, 2002; Sumner & Spietz, 1994). Mutual interaction is an example of a contingent interaction; this type of interaction has been found to positively influence cognitive development of children (Clarke-Stewart, 1973;

Beckwith & Rodning, 1996; Kelly, Morisset, Barnard, Hammond & Booth, 1996; Ramey et al., 1979).

Attunement and synchrony occur when the mother shows sensitivity to her child's cues, which then alleviates the child's distress. The mother must accurately read her child's cues, realize that the child is in distress, and concomitantly know what to do to relieve it, in order to respond with attunement and synchrony (Sumner & Spietz, 1994).

The emotional availability of the mother allows provision of warmth, love, affection, and acceptance (Chase-Lansdale & Pittman, 2002; Clarke-Stewart, 1973). When a mother is emotionally available, the interactions are "rich in . . . positive affect, [and] verbal stimulation . . . [with] a sufficient repertoire of behaviors such as talking, smiling, and body movements" (Sumner & Spietz, 1994, p. 8). Positive maternal affect, physical contact with the child, and maternal verbalizations directed at the child are all examples of emotional availability that have been reported to positively influence cognitive development scores (Chase-Lansdale et al., 2002; Clarke-Stewart, 1973; Kelly et al., 1996; Landry et al., 1997; Ramey et al., 1979; Smith et al., 1996).

Maternal Education and Maternal-Child Interaction

The model assumes that maternal-child interaction is influenced by maternal education and "several studies have demonstrated a relation between the quality of mother-child interaction and maternal education" (VanBakel & Riksen-Walraven, 2002, p. 258). Intelligence has also been found to be associated with quality of parenting and with education; therefore, parents with higher education may be expected to provide more optimal parenting because of their intelligence (VanBakel & Riksen-Walraven, 2002). Chase-Lansdale and Pittman (2002) discussed findings that showed parents with increased education, intelligence, and positive styles were more responsive, engaging, and stimulating in their parenting. In addition to intelligence, it can be surmised as well that skills learned in post-secondary environments, such as tolerance and ability to plan tasks, may also assist in parenting (VanBakel & Riksen-Walraven, 2002).

Bi-Directional Influences

Reciprocity and mutuality mean that both the mother and child must adapt to each other. Both mother and child interact with and influence each other, an example of human ecology theory's reciprocal determinism or bi-directional influences (Bronfenbrenner, 1993). Child gender and age, two characteristics of the child, are also assumed to influence maternal-child interaction (Belsky, 1984; Chase-Lansdale & Pittman, 2002; McLoyd, 1990). Also, childhood illness or developmental challenges, such as pre-maturity, both influence responsiveness and clarity of cues given by the child – ultimately influencing maternal-child interaction (Sumner & Spietz, 1994). The relationship between maternal depressive symptoms and maternal-child interaction, part of the indirect relationship between poverty and child cognitive development, illustrated by the model, will be described next.

Maternal Depressive Symptoms and Maternal-Child Interaction

An infant's contribution to the maternal-child interaction, or reciprocal determinism, is affected by maternal depressive symptoms. One study found that infants mirrored their mothers' negative mood, called the contagion effect (Field, Healy, Goldstein, & Guthertz, 1990). The infants become less responsive to their parents, which itself lends negative impact to the maternal-child interaction (Letourneau, 2001). Why does the quality of maternal-child interaction depend upon maternal psychological well-being? Belsky (1984) first considered the optimal maternal-child interaction and then the type of personality that could provide this. Belsky thought that the sensitive parent personality could provide optimal maternal-child interaction. Belsky stated that "the sensitive individual . . . is able to decenter, and to appraise accurately the perspective of others, is able to empathize with them, and in addition, is able to adopt a nurturant orientation. It seems reasonable to speculate that people most able to do this would be mature, *psychologically healthy adults*" (Belsky, 1984, p. 85, emphasis added).

Depressive symptoms, such as increased feelings of apathy and low energy levels, decrease the reciprocity, mutuality, attunement, synchrony, and contingency of the maternal-child interaction (Sumner & Spietz, 1994). Mothers' feelings of sadness, worthlessness, or helplessness may contribute to low emotional availability to the child, ultimately resulting in fewer hugs, praises, or supportive statements. Irritability, lack of sleep, fatigue, and difficulty making decisions all have been linked to negative parenting behaviours such as threats, derogatory statements, and slaps (Conger, McCarty, Yang, Lahey, & Kropp 1984). Further, these symptoms of depression may affect mothers' patience and concentration negatively (McLoyd, 1990). McLoyd (1990) identified patience and concentration as two key components that enable a parent to reward, explain, consult, and negotiate with the child, and these in turn may affect attunement, synchrony, and cognitive growth fostering needed for optimal maternal-child interaction.

The model shows that poverty indirectly influences maternal-child interaction, through its' influence on maternal depressive symptoms (Conger et al., 1992; McLoyd, 1990). As the level of maternal depressive symptoms increases, it is expected that parenting capacity decreases (Chase-Lansdale & Pittman, 2002; Conger et al., 1992; Jackson et al., 2000; McLoyd, 1990); thus, maternal psychological well-being is considered to be a key influencer of parenting (Belsky, 1984; VanBakel & Riksen-Walraven, 2002).

Mothers with depressive symptomology have been found to have non-optimal maternal-child interactions characterized by less contingency, less positive engagement or supportive interaction, less positive affect, less frequent facial expressions, less affectionate behaviour, less responsiveness, less flexibility, less focus on infant, less verbal and non-verbal rewards, and less assignment of intentional agency to the infant (Beck, 1995; Campbell, Cohn, & Meyers 1995; Field et al., 1990; Lyons-Ruth et al., 1986; Martinez et al., 1996; Murray et al., 1993). In addition, mothers with depressive symptomology were frequently found to have flat expressions, negative attention, flat affective behaviour, critical verbalizations, interfering manipulation, intrusive behaviour, and hostile behaviours towards their children. Furthermore, mothers with depressive symptoms have been found to omit reasoning with their children and use harsh, physical punishment to discipline (Beck, 1995; Campbell et al., 1995; Chase-Lansdale & Pittman, 2002; Field et al., 1990; Lyons-Ruth et al., 1986; Martinez et al., 1996; McLoyd, 1990; Murray et al., 1993).

The majority of research studies reviewed did not use a standard instrument to assess maternal-child interaction, as about two-thirds of the studies used self-created instruments; however, there are similarities among items assessed, which can be seen in the examples of common techniques listed in Table 3.0. Despite the various maternal-child interaction measures that may be measuring slightly different phenomena, all

studies identified a relationship between increased maternal depressive symptoms and increased non-optimal maternal-child interaction (Beck, 1995; Campbell et al., 1995; Field et al., 1990; Letourneau, 1997; Lyons-Ruth et al., 1986; Martinez et al., 1996; Murray et al., 1993).

Table 3.0 *Maternal-Child Interaction Assessment Instruments*

Maternal-child interaction measure	Description and references
Laboratory Observation of Mother-Child Behavior	Mothers are observed for talking to child, demonstrating toy, touching and holding child, mutual interaction, reading to child. Children are observed for playing alone, vocalizing, and fussing (Ramey et al., 1979).
Nursing Child Assessment Teaching Scale	Mothers are observed for sensitivity to cues, response to distress, social-emotional growth fostering, and cognitive growth fostering. Children are observed for clarity of cues and responsiveness to caregiver (Letourneau, 2001; Sumner & Spietz, 1994; Wallace et al., 1998).
Ainsworth Strange Situation	Researchers observe as mother leaves and then rejoins her child; first leaving the child with a stranger then leaving the child alone. The separations are intended to be mildly stressful in order to increase the intensity of activation of the attachment behaviour (Beckwith & Rodning, 1996; Lyons-Ruth et al., 1986).

Maternal-child interaction measure	Description and references
Maternal Speech to Infant	Transcripts of mothers' speech are assessed for complexity, syntax, focus, negative affect, and ascription of infant agency (Murray et al., 1993).
Observed Maternal Behavior	Warm sensitivity, maintaining infant interest and directiveness are observed (Landry et al., 1997; Smith et al., 1996).
Cohn's Coding System	Mothers' behaviours are observed for states of anger/poke (handling infant in a grossly angry way, or roughly poking or pulling at infant), disengaging (mother is neutral in affect and not interacting with infant), eliciting (rapid or staccato actions that appear to be intended to get infant's attention), and playing (positive affective expression). Infants' behaviour states were coded as protesting (negative affective expressions), looking away (gaze directed away from mother), attending (neutral affective expression with gazing toward mother), and playing (positive facial expressions with gazing toward mother) (Field et al., 1990).

In summary, given the nature of depressive symptoms and the demand of maternal-child interactions, it is not surprising that maternal depressive symptoms are related to non-optimal maternal-child interaction. Next, further to the right in the model, the relationship between maternal-child interaction and young children's cognitive development is addressed.

Maternal-Child Interaction and Young Children's Cognitive Development

Belsky (1984) thought that parenting influences child development and Van Bakel and Riksen-Walraven (2002) add that this phenomenon has been found across cultures. The model assumes that "high levels of psychological distress may lead to inadequate or impaired parenting and adverse child outcomes" (Conger et al., 1992; Jackson et al., 2000, p. 1410).

First, it must be acknowledged that the mother's role is more extensive than the child's in the parent-child relationship (Sumner & Speitz, 1994). Young children's interaction environments consist of their parents and caregivers, as they are totally dependent upon their parents for survival. Early childhood experiences within the microsystem, such as maternal-child interaction, contribute to neural sculpting and biological embedding (described in Chapter 2).

To foster cognitive development, the mother must provide cognitive stimulation appropriate to the child according to his/her state, individual capacities, and developmental level. Also, to foster cognitive growth, the mother must be aware of the child's level of development and challenge the child to engage in activities slightly more advanced than his/her current level; this is called scaffolding (Santrock, 1995). To scaffold, the mother must continually adapt care-giving patterns to suit the next developmental level of the child (Clarke-Stewart, 1973; Sumner & Spietz, 1994). Child cognitive growth is also fostered when a range of materials and experiences are offered that are rich in verbal content, teach key concepts, and stimulate thinking (Belsky, 1984; Chase-Lansdale & Pittman, 2002; Sumner & Spietz, 1994). Maintaining infants' interest is one way to foster cognitive development (Clarke-Stewart, 1973; Landry et al., 1997; Smith et al., 1996), and is an example of reciprocity and mutuality, which has been found to positively influence cognitive development (Clarke-Stewart, 1973; Landry et al., 1997; Smith et al., 1996).

Overall, a mother needs to be aware of her child's needs and wishes – hunger, fatigue, and desire for physical or social contact. Conversely, a child must show clarity in the cues presented to her/his mother. For example, cues to show sleepiness or hunger must be clear and consistent, in order for the mother to recognize them (Sumner & Spietz, 1994). Maternal sensitivity or nurturing, an example of attunement and synchrony, has been found to positively affect cognitive development (Beckwith & Rodning, 1996; Chase-Lansdale & Pittman, 2002; Jackson et al., 2000; Kelly et al., 1996; McLoyd, 1990; NICHD, 1998).

As shown earlier, there are various maternal-child interaction measures that may be measuring slightly different phenomena; however, despite the inconsistency in measures, the majority of studies found that positive qualities of maternal-child interaction enhance cognitive development in young children (Beckwith & Rodning, 1996; Brooks-Gunn et al., 1999; Chase-Lansdale et al., 2002; Clarke-Stewart, 1973; Kelly et al., 1996; Klebanov et al., 1998; Landry et al., 1997; Letourneau, 1997, 2001; Lyons-Ruth et al., 1986; Murray et al., 1993; NICHD, 1998; Parks & Smeriglio, 1986; Ramey et al., 1979; Smith et al., 1996). The consistent use of the Bayley Scale of Infant

Development, Mental Development Index to measure children's cognitive development as it relates to maternal-child interaction is a strength of the findings (Beckwith & Rodning, 1996; Clarke-Stewart, 1973; Klebanov et al., 1998; Landry et al., 1997; Letourneau, 2001; Lyons-Ruth et al., 1986; Murray et al., 1993; NICHD, 1998; Smith et al., 1996; Wallace et al., 1998).

Alternatively, non-optimal maternal-child interaction qualities have been reported to negatively affect cognitive development. Non-responsive interactions preclude sensitivity, create distress for the child, and reduce opportunities for cognitive growth stimulation and the socio-emotional development of the child (Halpern, 1993; McLoyd, 1990; Portes, Dunham, Williams, 1996). When a mother is restrictive, there is a lack of attunement, synchrony, and fostering of cognitive development. Restrictiveness has been found to negatively affect cognitive development (Belsky, 1984; Brooks-Gunn et al., 1999; Landry et al., 1997). Harsh and punitive parenting exemplifies a lack of reciprocity, mutuality, and emotional availability, all of which negatively influence cognitive development (Belsky, 1984; Brooks-Gunn et al., 1999). The absence of child-focused verbalization reflects a lack of emotional availability and contingency within the maternal-child interaction, and predicts lower levels of cognitive development (Murray et al., 1993; Sumner & Spietz, 1994).

A small Western Canadian study (n = 13) piloted an intervention intended to improve maternal-child interaction between mostly low-income adolescent mothers aged 15-19 years of age and their infants, based upon aspects of maternal-child interaction, measured by the Nursing Child Assessment Teaching Scale (Letourneau, 2001). The intervention group showed improvement in maternal-child interaction scores, and in infant cognitive development scores. Due to the small homogeneous sample, the results have little external validity, but point to the importance maternal-child interaction has in fostering cognitive development of infants.

Another study found that maternal-child interaction was not associated with child cognitive development measured at 12 months of age (Wallace et al., 1998). However, it can be speculated that the non-significant relationship occurred because the sample consisted of children from community childcare programs, known to influence cognitive development regardless of maternal-child interaction, and the basis of early intervention programs such as Head Start (Ramey et al., 1979). Another possible explanation is that it is a spurious finding.

In summary, optimal maternal-child interaction has been found to positively influence young children's cognitive development. Alternatively, non-optimal maternal-child interaction was found to negatively influence young children's cognitive development. Now that all the indirect relationships between poverty and maternal-child interaction have been described as illustrated by the model, the direct relationship between poverty and maternal-child interaction will be discussed.

Poverty And Maternal-Child Interaction

Belksy (1984) postulated that parenting is influenced by the broader social context in which the parent-child relationship is embedded and the model depicts this influence with the poverty variable. The macro- and exosystem, discussed previously, were shown to influence poverty in the microsystem. Further, the resources in the microsystem influence maternal-child interaction. At this point, the discussion has now come full circle, back to poverty influencing the microsystem.

Studies have found non-optimal maternal-child interactions among mothers living in poverty (Clarke-Stewart, 1973; Kelly et al., 1996; McLoyd, 1990; Ramey et al., 1979). In addition, level of socio-economic status was found to be an important variable in the relationship between parenting knowledge and quality of stimulation. Mothers with lower incomes scored lower on 6 of 8 care-giving measures (Wallace et al., 1998).

McLoyd (1990) thought that poverty decreased parents' ability to be supportive and consistent with children. For instance, one day a child may be praised, another day ignored, and another day scolded – all for the same behaviour and consequently all of these mixed messages confuse the child (Halpern, 1993). Lack of consistency in the child's parenting environment inhibits the child's ability to expect events and may impinge on cognitive development (Letourneau, 2001).

Poverty negatively influences the quality of maternal-child interaction in a number of ways. The lack of resources to meet basic needs may negatively influence the quality of the maternal-child interaction through undermining contingent responsiveness and emotional availability of mothers (Halpern, 1993). Low levels of family income may also preclude the availability of resources for facilitating maternal-child interactions, such as educational toys. Second, there are many stressors in the impoverished environment that may distract mothers or take away from parenting time, which leads to less effective maternal-child interaction (Chase-Lansdale & Pittman, 2002). Third, the stressors in the environment may lead to increased maternal depressive symptoms, previously discussed as negatively influencing maternal-child interaction. Interestingly, McLoyd (1990) thought that "economic and social class differences in child-rearing behaviours are partly explained by differences in psychological distress" (McLoyd, 1990, p. 332). Lastly, mothers' coping abilities are worn away by all of the stressors within the low-income environment, which can also interrupt adaptability and flexibility in situations that invariably arise while parenting.

In summary, few studies have examined poverty directly influencing maternal-child interaction. Nevertheless, in studies that have examined maternal-child interaction in impoverished environments, the quality is non-optimal. Thus far, only select relationships have been focused on as illustrated by the model; however, there are more factors within impoverished environments that have not been discussed yet, but will be highlighted next.

Confounding Variables

Mothers' physical health, although less well established, is also thought to influence parenting. Physical health problems may lead to maternal depressive symptoms, which have already been discussed as a negative influence on maternal-child interaction and children's cognitive development (Chase-Lansdale & Pittman, 2002).

In regards to maternal depressive symptoms, it is important to note that, "recent epidemiological studies have consistently found that approximately 10% of women suffer from an episode of non-psychotic depression in the three-month period following delivery" (Murray et al., 1993, p.1083). For mothers of children over 3 months of age, this becomes less of a confounding variable; nevertheless, this must be taken into consideration in interpreting the findings of maternal depressive symptoms.

There are other relevant confounding variables that have not been included, due to brevity and the delimitations of this study, for example prenatal health of the mother, nutrition (protein-energy and micronutrient deficits), and exposure to environmental toxins to name a few (Wachs, 1996). Forms of abuse, for example drug abuse, spousal abuse, and child abuse have not been considered. The influence of the television as 'babysitter' was not considered either. Most confounding variables mentioned throughout this chapter were not included, due to inconsistency in research findings, unavailability of data, or the limited scope of the study.

Summary of the Literature Review

First, many studies have found that poverty has a negative influence on maternal psychological well-being, by increasing depressive symptomology. Notwithstanding, maternal education has also been found to influence maternal depressive symptoms.

Second, a substantial amount of literature has found that poverty negatively affects young children's cognitive development. Thus, increasing depth and duration of poverty contribute to poor outcomes of cognitive ability. Additionally, studies report an income gradient between income and young children's cognitive development when samples included families with diverse income levels. However, maternal education is also thought to influence cognitive development. Child age and gender have also been shown to influence children's cognitive outcomes.

Third, research has established that maternal depressive symptoms negatively influence young children's cognitive development and maternal-child interaction.

Maternal education, along with child age and gender, has been reported to influence maternal-child interaction.

Fourth, non-optimal maternal-child interaction has been reported to negatively affect the provision of child learning experiences within the home and cognitive development. Last, poverty has been found to negatively influence maternal-child interaction.

Gaps in the Literature

Canadian literature lacks studies on the relationships among poverty, maternal depressive symptoms, maternal-child interaction, and young children's cognitive development. And the literature more broadly lacks a focus on children younger than 2 years of age for the same relationships. Further, only studies with families of diverse income levels have reported an income gradient for cognitive development. To address gaps in current research, this study explored these relationships with a sample of Canadian children younger than 3 years of age, living in families in poverty.

The majority of research studies reviewed used self-created instruments to assess maternal-child interaction. This study used data collected by a standardized tool that measures maternal-child interaction, which enabled comparisons with other studies that have used this instrument and with standardized sample findings. The study also used data collected by a professionally-administered cognitive development instrument, which provides greater quality in measurement of child cognitive development than parent-report instruments that have been used in other studies.

A limitation of the literature is the lack of practical significance assigned to the findings of lower cognitive development scores. None of the studies reviewed discuss the magnitude of the scores and what it means for the children in their present and future contexts. Further, the literature does not provide studies that examine all of the relationships illustrated by the model in the same study. Ideally all the specified variables ought to be taken into consideration in order to more accurately investigate the relationships, as Bronfenbrenner's (1993) human ecology theory espouses.

To explore the relationships outlined by the model and to begin to fill the gaps in current research, the main purpose of the study was to examine how poverty affects *mothers and young children* in Canada. The operationalization of this research problem is found in the next chapter, Methods.

CHAPTER 4: METHODS

This study investigated the relationships among level of family income/depth of poverty, maternal depressive symptoms, maternal-child interaction, maternal education, child age, gender, and cognitive development of young children living in impoverished families in Edmonton. In this chapter the research objectives, hypotheses, design, source of data, and setting and sample are described. Further, the research procedures, ethical considerations, and study variables are operationalized and described. Finally, the data analysis is addressed.

Objectives

Overwhelming evidence points to the negative effects of poverty on families (Chase-Lansdale & Brooks-Gunn, 1995; Huston, 1991; Smith et al., 1997). Thus within an economically disadvantaged sample, two key objectives guiding this study are to examine:

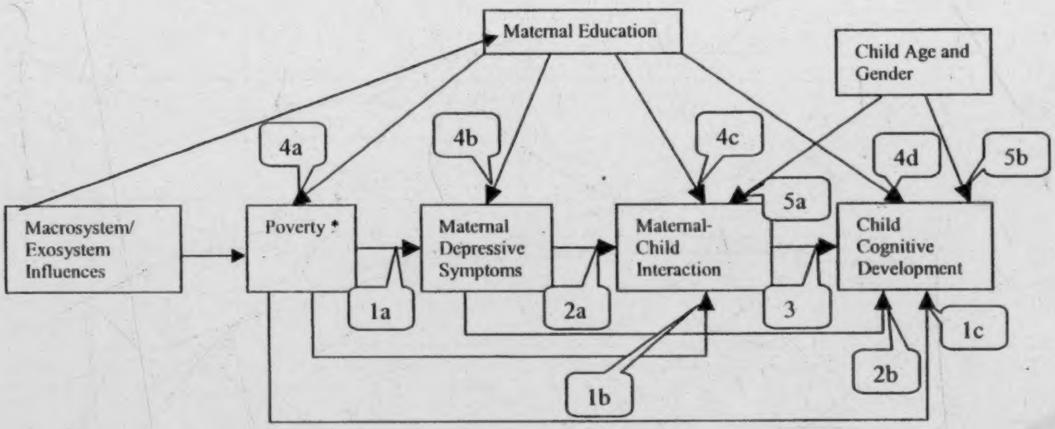
1. the bivariate and multivariate relationships illustrated in the model in Figure 2 (p. 60); and
2. whether the level of family income and depth of poverty, two different measures of low income, yield different results with respect to the relationships in Figure 2.

Hypotheses

Hypotheses based on Bronfenbrenner's (1993) human ecology theory, the model, and previous research findings were tested in this study. The hypotheses are outlined below and depicted in Figure 2 (p. 60). Within families living in poverty:

1. level of family income is negatively associated with (a) level of maternal depressive symptoms and positively associated with (b) optimal maternal-child interaction and (c) young children's cognitive development.
2. level of maternal depressive symptoms are negatively associated with (a) optimal maternal-child interaction and (b) young children's cognitive development.
3. optimal maternal-child interaction is positively associated with young children's cognitive development.
4. maternal education is positively associated with (a) income, (c) optimal maternal-child interaction, and (d) young children's cognitive development, and negatively associated with (b) level of maternal depressive symptoms (please see Figure 2 for clarification regarding the sequence of letters).
5. child age and gender are associated with (a) maternal-child interaction and (b) young children's cognitive development.

Figure 2. The Model With Hypotheses Attached


Maternal Education
Child Age and Gender
4a
4b
4c
4d
5a
5b
Macrosystem/ Exosystem Influences
Poverty *
Maternal Depressive Symptoms
Maternal-Child Interaction
Child Cognitive Development
1a
2a
3
1c
2b
1b

** Poverty = level of family income and income-to-needs ratios (depth of poverty)*

Note: the numbers and letters in the above diagram correspond to the hypotheses on the previous page

Design

A secondary analysis of data collected as part of a larger cross-sectional study was used to address the research objectives and hypotheses (Williamson, Fast, Kachur, Letourneau, & Raine, 1999; Williamson, et al., 2002). Cross-sectional studies were found to be common in the literature reviewed (Byrne et al., 1998; Chase-Lansdale et al., 2002; Field et al., 1990; Garcia-Coll et al., 1998; Lyons-Ruth et al., 1986). Cross-sectional studies with small sample sizes allow the use of direct observational assessments of children by trained professionals; whereas, studies with large sample sizes may have to rely on parent-report of information pertaining to child development (Miller, 1998).

The Larger Study: A Quantitative Study of the Effects of Welfare-to-Work on Pre-School Children's Health and Development

The Social Sciences and Humanities Research Council funded the larger study for the years 2000-2003. The purpose of the study was to explore the effects of the recent social policy trend promoting 'welfare-to-work' on the health and development of pre-school children living in poor families in Alberta.

Sampling Procedure and Recruitment

Participants in the larger welfare-to-work study were recruited through a number of strategies. In an attempt to obtain a sample that was representative of impoverished families throughout the city, graduate research assistants contacted community agencies serving individuals living in poverty from northern, southern, eastern, and western city quadrants. Also, the various community agencies that were contacted provide a variety of services, which aided in recruiting individuals representative of a range of poverty experiences. Meetings were arranged to speak with agency managers and staff about the research study and opportunities for recruitment. Some of the agency workers provided names of potential participants, many of whom agreed ahead of time to be contacted by telephone regarding the study. Other agency workers provided opportunities for face-to-face recruitment to ensure inclusion of poor families without telephones.

Information booths were set up at agencies for advertisement and direct recruitment. As one of the graduate research assistants on the larger project, I set up information booths at The Bissell Centre, Humans on Welfare, Poverty In Action forum, and Striving To Overcome Poverty (STOP). Also, I presented recruitment information to the Social Housing Action Committee members, eight of whom were low-income housing area representatives. Presentations were also made to a number of agencies, with direct recruitment following each presentation. For example, at the Candora Society of Edmonton and Distinctive Employment Counseling Services of Alberta (DECSA), a fellow graduate research assistant and I talked about the study with individuals engaged in employment-related activities.

Also, I placed posters (Appendix A) in community agencies to briefly describe the study and provide contact information for potential participants. In addition, flyers were delivered to low-income housing units in all quadrants of the city, in an effort to ensure a geographically diverse sample. Flyers contained the same information as the posters and were used with the intent to reach working-poor families not connected to community agencies. Delivering flyers also provided an opportunity for those without telephones to partake in the study. I also used snowball sampling by asking newly recruited participants if they were aware of contacts that may also be interested in participating in the study. Appendix B lists the community agencies, employment-related agencies, and community professionals that were contacted. Table 4.0 details the numbers of participants recruited and retained for the current study only, not the larger study.

Table 4.0 *Numbers of Participants Recruited and Retained*

Strategy	Number of Participants Recruited	Proportion of Sample
Community Agency	16	30.2%
Employment-related Program (welfare-to-work program)	8	15%
Flyer delivered to home	12	22.6%
Poster in community agency	3	5.7%
Snowball from another participant	11	20.8%
Internal/ Community Referral	3	5.7%
Total	53	100%

Eligibility to participate. The first step in recruitment was to determine an individual's interest in the study by explaining the study using prepared information sheets (Appendix C). Next, it was determined whether interested participants met the inclusion criteria of the study.

Inclusion Criteria. The measure of poverty, the Statistics Canada before-tax Low Income Cut-Offs (LICOs, Appendix D) were used for the larger study because many

Canadian studies examining poverty have used the LICOs (Ross et al., 1996; Ross & Roberts, 1999; Wade et al., 1999). To compare the findings from the larger study to other studies, it is prudent to use the same measure of poverty. Consequently, this study was also able to compare its findings to other Canadian studies.

Before-tax family income over the past year was required to be at or below the 2000 LICO (see Appendix D) that corresponded to the number of family members living in the household. The family was considered to be a group of people living together in the same place, related to each other by blood, marriage, or adoption; those in common-law relationships were also included (Statistics Canada, 2002).

Families with a child from birth to 59 months old, without diagnosed developmental delays, were eligible to participate in the larger study. Children with developmental delays were excluded for two reasons. First, they were excluded to control for influences on maternal-child interaction from young children with poor responsiveness and poor clarity of cues. Second, they were excluded to reduce potential impacts on IQ in order for a more normal sample to be acquired. The child with the next closest birth date was selected when families had more than one child younger than 59 months of age. Also, children had to be living with the parent partaking in the study at least 70% of the time, as data were collected from the person most knowledgeable (PMK) about the child. The accuracy of answers regarding the child may have been jeopardized if answered by a person not well acquainted with the child. The PMK had to be less than 65 years of age and could not have been receiving income from Assured Income for the Severely Handicapped, as participants had to be considered employable by government standards. The reason for including 'employable individuals' relates to the key focus of the larger study on welfare-to-work policy.

Once eligibility was established, further description of the interview was provided, including a description of the videotaped procedure for measuring maternal-child interaction. Once the participant agreed to take part, the time and day of the interview were agreed upon. A time most convenient and suitable for both the PMK and the child was determined by the PMK (however, requests for interviews later than 8:00 pm were not conducted). The participant was thanked for her/his time and interest in the project, and was asked if she/he knew of anyone else in a similar situation, whom she/he thought may be interested in partaking.

No special efforts were used to ensure equal distribution of child gender in all age groups, as the population of interest is not easy to access. However, near the completion of data collection, efforts were made to include children of certain ages and family income sources that were not well represented in the sample.

Research Procedures and Associated Ethical Considerations

Data Collection

Graduate research assistants and a clinical psychologist and her assistant collected the data in the summer and fall of 2001. Each interview followed a specified outline of instruments that were administered in the same order for each interview (Appendix E). The instruments contained mainly close-ended questions in several topic areas: family structure, income, work status, childcare, parent education, maternal-child interaction, parent depression, social support, economic strain, time stress, child behaviour, home environment, child receptive language, and cognitive ability. Only instruments relevant to the current study are discussed in this thesis.

All data collection instruments were administered in participants' homes, except for one participant who preferred an alternative meeting place. Since the interviews were within participants' homes, the data collected may be considered more ecologically valid than if data were collected in laboratory settings unfamiliar to the family (Barnard & Kelly, 1990). Collecting data about family and child outcomes in the home seems most appropriate, as the microsystem is where the family lives and the child develops. In addition, "an advantage to recording observations in the participants' homes is that their behaviour will be more 'natural'" (Barnard & Kelly, 1990, p. 288). It seems probable that parents and children are likely to behave more naturally and feel more at ease in their natural environment, than in a laboratory setting (Barnard & Kelly, 1990); however, the presence of the interviewer in the home or in a laboratory setting, may influence the behaviour of both parent and child. The 'Hawthorne effect' and social desirability bias may have been working and so mothers and older children may have acted in a way that they perceived was expected of them (Neutens & Rubinson, 1997).

The collection of data occurred at two separate meetings, ranging from 1 to 1.5 hours, for children 36 months and younger only. The structured interview guide was administered in the first half hour of the first meeting. Poverty has been associated with low educational attainment in some cases (Ross et al., 1996); thus, research assistants read all of the questions from the interview guide aloud and wrote participants' responses on paper, ensuring that the level of participants' literacy did not impede collection of accurate data.

Next, the maternal-child interaction episode was explained and then videotaped. Once the episode was complete, the remaining instruments were introduced one at a time and administered. At this point, participants were given a choice between continuing with their preference of having the interviewer administer the questions or self-administering the questions. The assumption was made that those with low-levels of literacy would choose to have the interviewer administer the remaining questions.

Once all of the instruments were completed, the interview came to a close and the participant was thanked for his/her time and presented with a $20 grocery store gift certificate as a token of appreciation for lost time and inconvenience. Before the research assistant left, the participant was reminded of the second data collection appointment. The participants were then referred to the next team, consisting of a clinical psychologist and her assistant who have many years experience measuring young children's cognitive development. Only one member of the psychology team measured cognitive development unless inter-rater reliability was being obtained. In this case, both team members attended the interview and both measured cognitive development. Once again the participant was thanked and provided with a $20 grocery store gift certificate.

Ethical Considerations

Prior to conducting the interview, informed signed consent was obtained from the PMK (see Appendix F) after the research assistant described the study in great detail, provided the information sheet about the study, described the benefits and the risks of the study, provided choice to partake, answered all of participants' questions, notified participants' that they may stop the interview at any time without giving a reason, assured confidentiality of identifying information, explained who would be accessing written information and video tapes, and was convinced of participants' understanding of the information and their agreement to allow their child to take several developmental tests along with being videotaped.

The larger study was reviewed and received approval from the Human Ethics Review Committee of the Faculty of Agriculture, Forestry, and Home Economics at the University of Alberta on May 28, 2001. The current study was reviewed and received approval from the Human Ethics Review Committee of the Faculty of Agriculture, Forestry, and Home Economics at the University of Alberta on November 12, 2002.

The Current Study: Health and Well-being of Mothers and Young Children in Poverty

Sample and Power

For the current study, a non-random, purposive sample of 53 mothers and children, 0-3 years of age, who were living in poverty were selected from a sample of 98 families recruited for the larger study. The current study used data collected by a fellow graduate research assistant (21 participants) and myself (39 participants). Cases with missing data, children over 36 months of age, and fathers were not retained from the larger data set for use in this study. Data from face-to-face interviews were analyzed to examine the hypotheses guiding this study.

Munro (1997) provided an effect size index, based upon power of .80 and an alpha of .05, for a small and moderate effect for multiple regression analyses with six independent variables. For a small effect (R^2= .02), a sample size of 39 was given, and for a moderate effect (R^2= .13), a sample size of 98 was given; thus, a sample size of 53 would likely allow for a small to moderate effect to be demonstrated.

Operationalization of Variables

Poverty

Two variables measuring poverty were used in the study. The actual dollar amount of family income received in the past twelve months, including all sources, before taxes, was used to create a continuous level of family income variable. In addition, depth of poverty was measured by using an income-to-needs ratio, a continuous variable, created by dividing family income by the LICO that corresponds with family size. The reason for using both income variables is that they measure two different dimensions of family income, which may provide valuable insights into how poverty affects mothers and children.

Maternal Depressive Symptoms

Maternal depressive symptoms were measured by the Center for Epidemiological Studies Depression scale (CES-D). The CES-D is a screening instrument, which consists of 20 items, with 4 response choices. The CES-D detects current symptoms of depression as experienced by the participant in the previous 7 days (Radloff, 1977). Symptoms measured include depressed mood, feelings of guilt, hopelessness, psychomotor retardation, loss of appetite, and sleep disturbances. The CES-D does not diagnose clinical depression, but instead identifies level of depressive symptoms (Radloff, 1977).

Scoring of the Centre for Epidemiological Studies Depression Scale (CES-D)

The CES-D score provides a continuous variable with scores potentially ranging from 0-60. Clinically significant levels of depressive symptoms are indicated by scores of 16 points or higher (Radloff, 1977). Lyons-Ruth et al. (1986) found that in a sample of mothers living in poverty, those who scored 0 on the CES-D had similar mother-child interactions as depressed mothers. Further, these mothers had different behaviour than the mothers without depressive symptoms. In light of these findings, Lyons-Ruth et al. (1986) caution that scores of 0 may indicate mothers denying depressive symptoms. The CES-D takes about 5 minutes to administer, and an example of one item on the scale is "I felt that everything I did was an effort" rarely or none of the time (less than one day), some or a little of the time (1-2 days), occasionally or a moderate amount of time (3-4 days), and most or all of the time (5-7 days) (CES-D instrument).

Validity of the Centre for Epidemiological Studies Depression Scale

The CES-D scale has been used extensively in many research studies (Coiro, 2001; Hall et al., 1985; Hope et al., 1999; Lyons-Ruth et al., 1986; Miller, 1998; Petterson & Albers, 2001). In addition, "it has been well validated in large-scale epidemiological studies, with 99% of patients with known depression scoring above 16" (Myers & Weissman, 1980, as cited in Lyons-Ruth et al., 1986, p.64).

The CES-D has excellent content validity, as the scale comprises symptoms of depression from previously validated longer scales (Radloff, 1977). The CES-D differentiates well between depressed and non-depressed individuals "with a false-positive rate of 6% and a false-negative rate of 36.4%" (Myers & Weissman, 1980, as cited in Lyons-Ruth et al., 1986, p.64). The CES-D is capable of discriminating between depressed psychiatric patients and the general population, with 70% of patients scoring 16 or above versus 21% of the general population, which demonstrates high construct validity. In addition, the CES-D items are based upon what is known about the theory and epidemiology of depressive symptoms. Therefore, substantive evidence of construct validity holds across population sub-groups as well (Radloff, 1977). The CES-D correlates well with other valid depression scales and clinical and self-report criteria also have established that the CES-D has excellent concurrent validity (Radloff, 1977).

Reliability of the Center for Epidemiological Studies Depression Scale

Spearman-Brown halves of .85 for the general population and .90 for patient samples, provides evidence of high internal consistency. This provides evidence that all items on the CES-D measure the same concept, thus being a uni-dimensional instrument (Radloff, 1977). However, only acceptable test-retest reliability, of .45 to .70, was found due to varying levels of symptomatology, times between testing, and modes of data collection. For differences in ethnicity, gender, and level of education, a coefficient alpha of .80 was found, indicating its generalizability to diverse populations (Radloff, 1977).

Maternal-Child Interaction

The Nursing Child Assessment Teaching Scale (NCATS) was used to measure maternal-child interaction. The NCATS "consists of four sub-scales for the caregiver and two sub-scales for the child, with a total of 73 items for the entire scale" (Sumner & Spietz, 1994, p.4). The NCATS uses observation to assess maternal-child interaction when the mother is teaching the child a *new* task, as the "researchers believed that children's first lessons about the world are communicated in seemingly casual day-to-day interactions" (Sumner & Spietz, 1994, p. 40).

The NCATS measures the behaviour of both the mother and child. The mother is assessed in terms of sensitivity to cues, response to distress, social-emotional growth fostering, and cognitive growth fostering. The child is assessed in terms of clarity of cues and responsiveness to mother; therefore, bi-directional influences between mother and child are captured to some extent (Sumner & Spietz, 1994).

Scoring the Nursing Child Assessment Teaching Scale

The NCATS took approximately 20 minutes to administer, and mother-child teaching episodes were recorded by a hand-held camcorder. A fellow graduate research assistant and I completed a full-weekend training course in NCATS, to administer and code the NCATS episodes. Consequently, I achieved a reliability of 90% with the University of Washington, Seattle NCATS database, in order that I may code episodes for research purposes. Scores are derived from 73 items scored either yes or no, the higher the score the more optimal the interaction quality. The tenth percentile cut-off (the threshold indicating worrisome scores) score for caregiver/child total is 47 for children 1-12 months of age and 54 for children 13-36 months of age (Sumner & Spietz, 1994). The NCATS score provides a continuous variable.

One example of a teaching activity appropriate for a child 18-24 months of age is "child can string beads." An example of an item on the NCATS scale assessing the maternal-child interaction is "caregiver describes the perceptual qualities of the task materials to the child" – from the Cognitive Growth Fostering Sub-scale" (Sumner & Spietz, 1994).

Validity of the Nursing Child Assessment Teaching Scale

The NCATS is a "reliable and valid means of observing and rating caregiver-child interactions for the purpose of assessing whether a dyad has problems in their interaction and communication pattern" (Sumner & Spietz, 1994, p. 105). The validity of the NCATS has been established by a "normative sample" of 2100 cases, provided by reliability cases submitted to NCATS from all over the United States, made up of 1-36 month-old children (Sumner & Spietz, 1994). The NCATS administered at 1 month of age was highly related to subsequent language and IQ outcomes (Sumner & Spietz, 1994), demonstrating high construct validity. In addition, differences in maternal-child interaction detected by NCATS were predictive of differences in infant development based on the BSID (Sumner & Spietz, 1994), also supporting construct validity.

Demonstrating both concurrent and convergent validity, two sub-scales of the NCATS, Fostering Social-Emotional and Cognitive Growth, consistently showed the strongest relations to the total Home Observation Measure of the Environment (HOME) scale, which also focuses on the quality of learning opportunities provided to children (Sumner & Spietz, 1994). In addition, the overall NCATS "correlate[d] with the Feeding (NCAFS) and with the HOME inventory. The correlations [were] moderate, in the .40-.50 range, and suggest there are both overlapping and separate aspects of the [maternal-child interaction] being tapped by the three scales" (Sumner & Spietz, 1994, p. 105).

Reliability of the Nursing Child Assessment Teaching Scale

To ensure that the NCATS was introduced consistently, the following was repeated to the mother being interviewed, "The next part of the interview is where I will videotape you teaching your child a task she/he does not know how to do yet to get an idea of your parenting style." Next, I would hand the caregiver the Children's Activities Card, which list activities children from birth through 4 years of age can do saying: "Here is a list of activities children ranging in age from birth through 4 years can do. Please read through the list. Let me know the first activity your child cannot do." Once they had selected the task, I gave them the materials needed for the task from the teaching kit and said, “See you if you can teach (child’s name) to (describe the activity they have chosen) i.e. hold on the rattle, turn the page of the book, etc. Take as long as you like. Please let me know when you are done” (Sumner & Spietz, 1994, p. 135). Once the caregiver indicated he/she was done, I stopped the video. This procedure was consistently followed to ensure bias was not at play.

In terms of test-retest reliability, a .85 for Total Parent Score and .55 for Total Child Score were reported, which reflect a greater stability in the parent score versus the child score, possibly due to developmental maturation (Sumner & Spietz, 1994). For internal consistency, a total score of .87 was reported, which suggests that, together, the items of the NCATS tap one dimension of behaviour (Sumner & Spietz, 1994).

Coding the NCATS episodes took approximately 112 hours for the 45 episodes I coded for the larger study. This includes the inter- and intra-rater reliability coding of episodes. Coding took approximately 2.5 hours per episode; however, some episodes took as long as 3.5 hours to code. On rare occasions episode coding was complete in 1.5 hours. In order to code NCATS episodes, the definition of each of the 73 items had to be remembered, as well as the qualifications for each item that consisted of either time elements (seconds), amount of times it needed to occur, distance between mother and child (inches), or contingency elements.

Once seven episodes had been individually coded, one episode was selected and coded by the other research assistant to establish inter-rater reliability. Scores were then compared between what had been originally coded and the second inter-rater coding score. The total number of items disagreed upon were counted, and a table from the NCATS manual provided a percentage score of inter-rater reliability (Sumner & Spietz, 1994, p. 85). The inter-rater reliability achieved was 91% over five inter-rater episodes. When the other research assistant moved away I continued coding the episodes and maintained an intra-rater reliability of 94.5% for the four re-coded episodes. The first episode was chosen by the research assistant for intra-rating, as instructions for use of the random numbers table were provided after its completion. All other episodes were selected for intra-rater reliability using a random numbers table. The first selection happened to have poor audio, so the next random number was chosen to identify another episode.

Child Age, Child Gender, and Maternal Education

Child age and gender, as well as maternal education were examined in the multivariate analyses. It is important to include maternal education, as it has been found to influence all of the key variables. Children's age and gender have been found to influence maternal-child interaction and child cognitive development. These variables were included in analyses based upon consistency in the literature and availability of data.

The items that were used to collect these data are on page 1 and page 32 of the interview guide (Appendix G). Maternal education (years) and child age (months) were measured as continuous variables; child gender was measured as a dichotomous variable (0 = males, 1 = females). Maternal education and child age were further categorized into ordinal scales for use in ANOVA analysis only. Maternal education categories included 0-11 years, 12 years, and more than 12 years of formal education. The categories for child age included 0-12 months, 13-24 months, and 25-36 months of age.

Young Children's Cognitive Development

The Mental Development Index (MDI) of the Bayley Scales of Infant Development, Second Edition was used to measure young children's cognitive development. Cognitive development was assessed by observation of children's interactions with stimuli introduced by the clinical psychologist or her assistant. The MDI assesses cognitive, language, and personal social development of children (Bayley, 1993), and has been used extensively in studies examining the cognitive development of children (Beckwith & Rodning, 1996; Garcia-Coll et al., 1998; Klebanov et al., 1998; Landry et al., 1997; Murray, 1992; NICHD, 1998; Wallace et al., 1998). Items included on the MDI assess "memory, habituation, problem solving, early number concepts, generalization, classification, vocalizations, language and social skills" (Bayley, 1993, p.1).

The MDI is categorized as a power test, meaning that items are ordered according to their degree of difficulty. If the child passes one level she/he goes on to the next appropriate level for testing (Bayley, 1993). The content of the MDI is characterized by a "theoretically eclectic" nature, as the content was derived from a number of scales of development, as well as a broad cross-section of child research (Bayley, 1993).

Scoring the Mental Development Index

The MDI score is a continuous variable, consisting of scores in four categories: (1) "accelerated performance" 115 and above, (2) "within normal limits" from 85-114, (3) "mildly delayed performance" from 70-84, and (4) "significantly delayed" 69 and below (Bayley, 1993, p. 228). A score of 100 is considered standard. In the study, sample MDI scores were compared to established norms for cognitive development of same-age peers. The MDI takes about 1 hour to administer. An example of a MDI test item for a 5-month-old child is "fixates on disappearing ball for two seconds" (Bayley, 1993, p.73).

Validity of the Mental Development Index

The MDI has been standardized by a U.S. national, stratified, random sample of 1700 infants 1-42 months of age. Content validity was established through a multi-step process wherein experts identified ability domains relevant to developmental assessment. Items on the MDI adequately covered the domains (Bayley, 1993).

In terms of concurrent validity, the MDI is strongly correlated with both the Wechsler Preschool and Primary Scale of Intelligence-Revised (WWPSI-R) and the McCarthy Scales, which also measure intelligence (Bayley, 1993). These strong correlations between instruments suggest that the MDI also measures a similar construct. In evaluating construct validity, experts reported the MDI items correlated strongly with the domains they represent (Bayley, 1993). In addition, MDI scores and IQ scores are reportedly associated (Lyons-Ruth et al., 1986). Still, as with other measures of infant cognition, the MDI has low predictive ability, which is a limitation in terms of interpreting the relevance of the findings.

Reliability of the Mental Development Index

The MDI was found to have a reliability coefficient average of .88 for children 4-36 months of age, indicating a highly reliable instrument with low error variance (Bayley, 1993; LoBiondo-Wood & Haber, 1994). An initial test was performed and 1-16 days later another test was performed, with a median time of 4 days, for test-retest reliability (Bayley, 1993). The stability coefficient for children 1-12 months of age was r = .83 and for those 24-36 months of age, it was r = .91. Both stability coefficients indicate a highly reliable instrument. The psychologist and her assistant who were conducting the MDI achieved an inter-rater reliability of 99%, over nine inter-rater observations. Table 4.1 provides an overview of the above key variables along with socio-demographic variables that were used to describe the sample.

Table 4.1 *Key Variables and Socio-demographic Variables*

Variable
Key variables
Level of family income*
Income-to-needs ratio (depth of poverty)*
CES-D scores
NCATS scores
Child age in months*
Child gender*
Maternal education (number of years of formal education)*
MDI scores
Socio-demographic characteristics of sample
Maternal age
Main source of family income (working poor, mixed income poor, and social assistance poor)**
Aboriginal/First Nations/Metis status

Marital status (single never married, married living with spouse or common-law, and separated/divorced)

Number of people in the family

Number of children in the family

**Note: also considered socio-demographic variables*

***Note: working poor income sources include wages/salaries, income from self-employment, student loans, employment insurance, worker's compensation, child support, spousal support/alimony; social assistance poor income sources include social assistance/welfare and grants from the Student Finance Board; mixed income poor income sources include both working poor and social assistance poor income sources plus supplement to income.*

Data Analysis

The data analysis involved the use of descriptive statistics, as well as bivariate and multivariate analyses. The first step involved screening the sample data. Next, descriptive data analysis commenced and included measurement of central tendency (frequency, mean, median, mode, sum), distribution (skewness, kurtosis), and dispersion (standard deviation, variance, range, minimum, maximum, standard error of the mean).

Variables identified as outside of the normal curve were dealt with appropriately. ANOVAs, t-tests, and Pearson Product Moment correlations were used to describe the data and examine bivariate relationships between key variables (see Tables 4.1 and 4.2).

Table 4.2 *Independent t-tests and ANOVAs*

Variable	Analysis
Maternal education (0-11 yrs, 12 yrs, >12 yrs)	ANOVA examined significant group differences for all key variables
Child age (0-12 mos., 13-24 mos., 25-36 mos.)	ANOVA examined group differences for all key variables
Child gender	Independent t-tests examined significant group differences for all key variables

Lastly, standard multiple regression analyses were used to test the hypotheses (see Table 4.3). Collinearity diagnostics were requested to ascertain whether any two variables were so highly correlated that they should not be considered together in the same analysis. An alpha of .05 determined statistical significance of the results of t-tests, ANOVAs, Pearson Product Moment correlations, and standard multiple regression analyses. One-tailed tests were used wherever the t-distribution was employed (see Results, p. 96).

Normality, linearity, and homoscedasticity are three assumptions that must be met prior to running multiple regression analysis (Tabachnick & Fidell, 1989). Munro (1997) provides the following descriptions.

1. "The sample must be representative of the population to which the inference will be made.

2. The variables that are being correlated, say X and Y, must each have a normal distribution; that is, the distribution of their scores must approximate the normal curve.

3. For every value of X, the distribution of Y scores must have approximately equal variability. This is called the assumption of homoscedasticity.

4. The relationship between X and Y must be linear; that is, when the two scores for each individual are graphed, they should tend to form a straight line. The points will not fall on this line, but they should be scattered closely around it" (Munro, 1997, pp. 247-248).

Residual scatterplots were requested with the initial regression analysis, which tested for normality, homoscedasticity, and linearity.

Standard multiple regression analysis was chosen for four reasons. First, ecological models, such as the one guiding this study, Bronfenbrenner's (1993) human ecology theory, do not specify which variables within the microsystem are of greater importance; therefore, hierarchical or stepwise regression was not used, as a specified entry of variables into regression analysis is required. Second, the research objectives were adequately addressed using standard multiple regression, which assesses the relationships among variables, and as Tabachnick and Fidell (1989) point out, "unless there is good reason to use some other technique, standard multiple regression is recommended" (p. 150). Third, I am a neophyte regarding multiple regression, and since analysis of hierarchical or stepwise regression models are more complex than standard multiple regression, it seemed prudent to use standard multiple regression (Tabachnick &

Fidell, 1989). Fourth, employing multiple regression analyses allowed for the relationships between variables to be illuminated while considering other key variables known to influence the dependent variables (DVs).

Tabachnick and Fidell (1989) recommend twenty more cases than independent variables (IVs); however, "a bare minimum requirement is to have at least five times more cases than IVs – at least twenty-five cases if five IVs are used" (Tabachnick & Fidell, 1989, p.129). Other sources say that a general rule is ten times the number of cases for each IV (Darlington, 1990; Munro, 1997).

The data analysis consisted of six standard multiple regressions (MR), three used level of family income as an IV and the other three used income-to-needs ratio as IV (see Table 4.3 for variable names). In Model 1 and 2, there were two IVs respectively, which provided 27 cases per IV, well above the recommended ratio (Tabachnick & Fidell, 1989). In Model 3 and 4, there were five IVs respectively, which provided 11 cases per IV, again within the recommended range and well above the 'bare minimum' (Tabachnick & Fidell, 1989). Finally, in Model 5 and 6, there were six IVs respectively; therefore, that is almost nine cases per IV, which is within the recommended range of 5-20 (Tabachnick & Fidell, 1989). The results are presented in the next chapter.

Table 4.3 *Standard Multiple Regression Models*

Hypotheses Tested	Variables		Standard Multiple Regression Model
	IV(s)	DV	
1a, 4b	Level of family income and maternal education	CES-D	1
1a, 4b	Income-to-needs ratio and maternal education	CES-D	2
1b, 2a, 4c, and 5a	Level of family income, CES-D, maternal education, child age, and child gender	NCATS	3
1b, 2a, 4c, and 5a	Income-to-needs ratio, CES-D score, maternal education, child age and gender	NCATS	4
1c, 2b, 3, 4d, and 5b	Level of family income, CES-D, NCATS, maternal education, child age and gender	MDI	5
1c, 2b, 3, 4d, and 5b	Income-to-needs ratio, CES-D, NCATS, maternal education, child age and gender	MDI	6

CHAPTER 5: RESULTS

This chapter begins with a description of how the sample data were screened. Next, a description of the sample's socio-demographic characteristics and key variables follows. There are eight key variables: the level of family income ($), income-to-needs ratio, maternal depressive symptoms (CES-D), maternal-child interaction (NCATS), maternal education, child age, child gender, and child cognitive development (MDI). Then results of the ANOVAs and an independent t-test are presented, followed by the results from the bivariate and multivariate analyses that were used to test the hypotheses.

Screening of Sample Data

Univariate Descriptive Statistics

First, I inspected univariate descriptive statistics for accuracy of data entry. There were no out-of-range values, and all means and standard deviations appeared plausible; however, there were seven outliers. An outlier is defined as a case "far from the mean and unconnected with other cases on either plots or z-scores" (Tabachnick & Fidell, 2001, p.118). I viewed the boxplots of all variables to determine outliers. There were two outliers for family income and both were over $34, 396, yet they did not exceed the LICOs. An outlier of 18 years for maternal education was found, which may be unusual for a low-income sample, but education is only one of many factors that may influence income level. A score of 45 on the CES-D scale was also an outlier, but 60 is the maximum score and considering previous findings, which indicate high levels of depressive symptoms in low-income samples, it was not completely unexpected. There were two outliers for MDI scores, one was 51, a significant delay, and the other one was 128, indicative of an accelerated performance. The delay was expected based upon research findings that low-income children have low cognitive scores, but the accelerated score also seemed likely given that it may be a case of resiliency (previously mentioned in Chapter 3). Lastly, a score of 35 on NCATS was found to be an outlier, but not an unexpected one as non-optimal maternal-child interactions have been found previously in low-income samples. All univariate outliers appeared to most likely be from the sample's population and thus were retained.

Missing Data, Linearity, and Homoscedasticity

Next, I checked for missing data and found only one case that was missing information regarding a child's Aboriginal/First Nations/Metis status. No other cases were missing data. Pair-wise plots were assessed for nonlinearity and heteroscedasticity and most appeared linear; however, some were more linear than others. In addition, they appeared to be homoscedastic.

Residuals

A regression analysis was performed to evaluate residual plots for normality (residuals against predicted scores; see Munro, 1997) to test all the assumptions for conducting regression analyses, as previously outlined in Chapter 4. Using a histogram of the standardized residuals, NCATS appeared to be normally distributed, CES-D appeared to be slightly positively skewed, and MDI was very negatively skewed.

Skewness and Kurtosis

Although the residual plots test all assumptions of regression (Tabachnick & Fidell, 2001), I preferred to evaluate skewness and kurtosis scores to be certain of my conclusions drawn from the residual plots. Thus skewness and kurtosis scores were assessed for each of the key variables. Significant skewness was determined by multiplying each skewness standard error by 2, and if the skewness value exceeded this score it was deemed significant (SPSS, 2002). Significant kurtosis was determined by dividing the kurtosis value by its standard error. If the resulting value was greater than 2 or less than -2, it was deemed significant (SPSS, 2002). Significant skewness scores were found for the level of family income, MDI, and CES-D and significant kurtosis was found for MDI, which coincided with the findings of the residual plots.

Square Root Transformations

Based upon the findings of the residual plots and significant skewness and kurtosis values, square root transformations were attempted for level of family income, MDI, and CES-D. The transformation of level of family income was successful based upon the histogram (level of family income, square root) that appeared to be normally distributed. The transformed variable was used in bivariate and multivariate analyses.

Upon examining the CES-D (square root) histogram, it appeared to have become a slight negative skew instead of a slight positive skew. Tabachnick and Fidell (2001) advise, "if a variable is only moderately positively skewed, for instance, a square root transformation may make the variable moderately negatively skewed, and there is no advantage to transformation" (p. 81); thus, the CES-D variable was left unchanged since there was no advantage to transforming it.

The histogram for MDI (square root, sr) appeared to be slightly more normal than the histogram of MDI before transformation. To verify this I ran another regression using MDI (sr) to examine the residual plot, which appeared to be normally distributed; thus, I retained the transformed variable for use in bivariate and multivariate analyses.

Reassessment of Skewness and Kurtosis

Tabachnick and Fidell (2001) suggest reassessing skewness and kurtosis after variables are transformed. Skewness (kurtosis for MDI, sr only) values were assessed for improvement.

Table 5.0 *Skewness and Kurtosis for Level of Family Income and MDI Pre- and Post-transformation*

Transformed Variable	Skewness Pre-transformation	Skewness Post-transformation	Kurtosis Pre-transformation	Kurtosis Post-transformation
Level of Family income	.929*	.425	-	-
MDI	-.770*	.657*	2.3*	3.5*

*Note: * indicates significant skewness and kurtosis*

After level of family income was transformed into its' square root, it was no longer significantly skewed. Conversely, MDI (sr) had improved skewness, but it remained significant. Positive skewness is expected to influence the mean, median, and mode in a certain way, that is, "the mean will have the largest value, and the mode the lowest" (Glass & Hopkins, 1996, p. 89). Upon examination, the positive skewness of MDI (sr) did have this effect.

The kurtosis value for MDI increased and remained significant post-transformation. Despite the fact that the transformed MDI had significant kurtosis, no further transformations were considered because the histogram for MDI (sr) residuals appeared to be normally distributed, which meets all of the assumptions for multiple regression (Tabachnick & Fidell, 2001). In addition, Glass and Hopkins (1996) state, "ordinarily, there is far less interest in the kurtosis of a distribution as a descriptive statistic than in its central tendency, variability, and skewness" (p. 92).

Furthermore, according to the central limit theorem "if n >25, the sampling distribution of [the sample mean] is essentially normal and confidence intervals for [the population mean] can be assumed to be accurate even for non-normal populations" (Glass & Hopkins, 1996, p. 247). In short, no further transformations were deemed necessary or attempted.

Multivariate Outliers

Using SPSS regression, I acquired Mahalanobis distance values through the SAVE command, upon running a preliminary regression. These values were saved as separate columns in the data file, and then examined using descriptive statistics. The degrees of freedom were equal to the number of IVs used in the regression. A significance level of $p< .001$, stated to be a conservative measure, was used with the Chi square table to identify significant multivariate outliers. No cases were found to have a Mahalanobis distance greater than the Chi square critical value; thus there were no multivariate outliers (Tabachnick & Fidell, 2001).

Multicollinearity and Singularity

Next, key variables were evaluated for multicollinearity and singularity. Multicollinear and singular variables are identified as "variables [that] are very highly correlated (say .90 and above); with singularity, the variables are redundant; one of the variables is a combination of two or more variables" (Tabachnick & Fidell, 2001, p. 82). There were no correlations above .90 in the correlation matrix of all key variables. Collinearity diagnostics were requested with the SPSS regressions. None of the tolerances (1 – SMC, squared multiple correlations) approached zero in any of the regression collinearity diagnostics, indicating no cause for concern (Tabachnick & Fidell, 2001). Tabachnick and Fidell (2001) warned that the computer would 'balk' if singularity was present, but the computer did not 'balk' (the run did not abort). The SPSS computer program will abort multiple regression runs based upon set default values for singularlity (Tabachnick & Fidell, 2001).

Despite the multicollinear diagnostics, three variables representative of socioeconomic status (SES) (level of family income (sr), income-to-needs ratio, maternal education) had stronger correlations with each other than each had with the DVs, CES-D and NCATS, indicating multicollinearity. However, Darlington (1990) states, "if you want to test whether SES affects a dependent variable, you can do so efficiently even if SES is measured by several highly collinear variables" (p. 130). Following Darlington's suggestion, I decided to use maternal education with level of family income (sr) and maternal education with income-to-needs ratio in their respective multivariate analyses.

Nonetheless, multicollinearity can make it difficult for SPSS to partition the variance between two variables (Dr. D. Williamson, personal communication, February 26, 2003), thus it makes it difficult to identify with absolute certainty which variable is really influencing the DV.

Description of the Sample

Socio-Demographic Characteristics

The sample included 53 mother-child dyads living in poverty, which was measured as income at or below the LICOs. Table 5.1, 5.2, and 5.3 present the socio-demographic characteristics of the sample. Table 5.3 also includes key variables that are considered socio-demographic characteristics. The socio-demographic characteristics are discussed first, followed by a discussion of the key variables. Mothers were asked about the source of their income (Table 5.1) over the past 12 months. Close to one quarter of the sample, categorized as working poor, received income from wages/salaries, self-employment, student loans, employment insurance, worker's compensation, child support, and spousal support/alimony; another quarter, categorized as social assistance poor, received their annual income from social assistance/welfare and grants from the Student Finance Board. About half of the sample, categorized as mixed income poor, had a mix of the above income sources. In addition, families with working members that received a supplement to income (social assistance derived) were classified as having a mixed income.

Table 5.1 *Percents and Frequencies for Discrete Socio-demographic Characteristics of the Sample*

Variables	Percent (frequency)
Marital status	
Single never married	54.7 (29)
Married living with spouse or common-law	28.3 (15)
Separated or divorced	17.0 (9)
Aboriginal/First Nations/Metis Status	
Mother	20.8 (11)
Child	28.3 (15)
Source of family income	
Exclusively working poor	26.4 (14)
Exclusively social assistance poor	24.5 (13)
Mixed source of income poor	49.1 (26)

Table 5.2 *Means and Standard Deviations for Continuous Socio-demographic characteristics of the sample*

Variables	Mean	SD	Range (minimum – maximum)
Number of people in family	3.13	1.13	2-6
Number of children in family	1.79	1.03	1-5
Maternal age	28.04	6.18	18-43

Table 5.3 *Means, Standard Deviations, and Ranges for Key Variables*

Key variables	Mean	SD	Range (minimum – maximum)
Level of family income ($)	18,006	6,589	6,476-37,824
Income-to-needs ratio	0.62	0.17	0.30-1.00
CES-D	17.72	10.25	0-45
NCATS	51.91	6.43	35-62
0 – 12 months * (10th percentile cut-off is 47)	49.56	7.17	38-62
13-24 months * (10th percentile cut-off is 54)	53.50	5.23	41-61
25-36 months * (10th percentile cut-off is 54)	52.71	6.40	35-60
MDI	97.34	13.11	51-128
0-12 months *	99.39	11.44	84-123
13-24 months *	95.89	14.70	71-128
25-36 months *	96.71	13.51	51-107
Child age (in months)	18.00	9.37	4-35
Child gender			
Female (n= 30)	56.6%		
Male (n= 23)	43.4%		
Maternal education (years of formal education)	11.66	2.07	7-18
Transformed variables			

Key variables	Mean	SD	Range (minimum – maximum)
Level of family income (sr)	132.00	23.88	80.47-194.48
MDI (sr)	4.34	1.25	1.00-8.83

Note. Level of family income, income-to-needs ratio, and child age and gender are key variables as well as socio-demographic characteristics of the sample.

**Note. Children 0-12 months (n= 18), 13-24 months (n= 18), and 25-36 months (n= 17).*

As required by sample selection criteria, all family incomes were low. The lowest level of family income was $6476 and the highest was $37,824, with $18,006 as the mean (Table 5.3). The income-to-needs ratio, as described in the Methods chapter, ranged from .30 to 1.00. A ratio of 1.00 indicates that family income is at the LICOs, while an income-to-needs ratio of .30 indicates that family income is 30% of the LICOs. The average income-to-needs ratio was .62.

Children ranged in age from 4 to 36 months. Slightly over half of the sample was female (Table 5.3). Since Aboriginal/First Nations/Metis are over-represented in poor populations, it was not unusual to observe a high representation of Aboriginal/First Nations/Metis in the sample (Table 5.1). On average there were three members per family (Table 5.2), two of whom were children. This average family size and composition is not surprising since over half of the sample consisted of single-mother families (Table 5.1). Close to 20% of the mothers were separated or divorced, leaving less than 30% of the children in the sample with a mother who lived with a partner. Mothers, for the most part, were in their late 20's (Table 5.2). Forty-three percent (n=23) of mothers had less than high school education and 47% (n=25) had more than high school education (not shown in tables), while the mean for years of formal education was 11.66 (Table 5.3).

Key Variables

Maternal Depressive Symptoms

The average score for CES-D (17.7) was above the cut-off score of 16 (Table 5.3), indicating clinically significant levels of depressive symptoms, as was expected for a sample of mothers living in poverty. Altogether, 57% of the sample had scores above this cut-off and Coiro (2001) states that this indicates mothers likely "have a clinical depression" (p. 10).

Maternal-Child Interaction

Over 66% of the children had NCATS scores below the 10th percentile, indicating "worrisome" non-optimal parent-child interactions. The finding was expected for a low-income sample. Specifically, children 13 months and over had average NCATS scores below the 10th percentile (Sumner & Spietz, 1994). However, if the average NCATS score for the 13-24 month age group is rounded up to 54, it would technically not be below, but instead at the cut-off.

Young Children's Cognitive Development

The average MDI score was 97, which is slightly below the average score of 100, and this was expected in a sample of children living in poverty. Thirteen percent (n= 7) of the children had scores more than one SD (15) below the mean (i.e., scores <85), indicating they may have developmental delays. In particular, 1.9% (n=1) of the sample may have significant delays, 11.3% (n=21) may have mild delays, while the vast majority (80%; n=42) of the sample had MDI scores within the normal range (85–114).

One-tailed Tests

The stated hypotheses, guided by theory and previous research, depict the direction of the relationships. Based upon the hypotheses, I have committed to a directional test. A one-tailed test is appropriate and more powerful than a two-tailed test based upon the assumption that "if X and Y are really correlated, we have a greater chance at arriving at the correct conclusion (i.e., of rejecting H_o) by using a one-tailed test" (Glass & Hopkins, 1996, p. 353). One-tailed tests were employed in the analyses wherever the t-distribution was employed (t-tests, correlations, and beta significance testing in regression equations).

Independent Samples t-Test

An Independent Samples t-test was performed to further examine MDI score differences for females and males. The t-test was significant at $p = .006$; thus, the null hypothesis that the male and female group come from populations with the same average MDI scores was rejected. Males had a lower average MDI score (92) than females (101). Since 100 is the mean MDI score, similar to other tests of cognition (Munro, 1997), the males scored below average and the females scored average. Twenty-one percent of males had significant and mildly delayed MDI scores compared to only 7% of females. Table 5.6 presents a more in-depth look at the differences in MDI performance by gender.

Table 5.6 *MDI Performance By Gender*

Gender	Significantly Delayed	Mildly Delayed	Within Normal Range	Accelerated
Female	0	2	25	3
(n=30)	(0%)	(7%)	(83%)	(10%)
Male	1	4	17	1
(n=23)	(4.3%)	(17.4%)	(74%)	(4.3%)

ANOVAs

An ANOVA was used to further explore income, maternal depressive symptoms, maternal-child interaction, and children's cognitive development by the categorical variable measuring years of maternal education (Table 5.5).

Table 5.5 *Mean Family Income, Income-to-Needs Ratio, CES-D Score, NCATS Score, and MDI Score by Maternal Education*

Variance source	Less than high school		High school		Post secondary education	
	M	SD	M	SD	M	SD
Level of family income ($)	**15,360* (.04)**	7,049	20,247	4,818	**20,177* (.04)**	5,680
Income-to-needs ratio	**.53* (.003)**	.17	.66	.14	**.70* (.003)**	.15
CES-D	**22* (.05)**	10	**10* (.05)**	7	15	10
NCATS	**49* (.01)**	7	54	5	**54* (.01)**	5
MDI	97	10	98	23	98	12

*$p \leq 05$ *in parentheses beneath corresponding mean*

Significant mean differences were found for level of family income and income-to-needs ratio by category of maternal education. Examining Bonferronni post-hoc test results, mothers with less than high school education had significantly lower levels of family income than mothers with post secondary education, as expected. In fact, the mean difference in incomes was $4817. Interestingly, the mean income for mothers with high school education was slightly higher than for mothers with post-secondary education. In addition, mothers with less than high school education had incomes 17% less of the LICOs than those with post secondary education.

Significant mean differences were found for level of maternal depressive symptoms by category of maternal education. Bonferronni post-hoc tests showed that the difference in CES-D scores was between those with less than high school education and those with high school education. Mothers with less than high school education scored on average 12 points higher on the CES-D versus those with high school education. As a group, the mean CES-D score for mothers with less than high school education was greater than 16, unlike the other two groups. No differences were found between those with post secondary education and the other two categories of maternal education.

Significant mean differences were also found for maternal-child interaction by maternal education. Specifically, the difference was between mothers with less than high school education and those with post secondary education. Mothers with less than high school education scored 5.3 points lower on NCATS, than mothers with post secondary education, which was expected. No significant mean differences were found for child cognitive development by maternal education.

An ANOVA was used to explore NCATS and MDI scores by age categories. There were no significant differences among NCATS or MDI scores by child age category.

Bivariate Correlations

In Table 5.4, inter-correlations among the eight key variables are presented. The majority of correlations were statistically significant and in the expected direction. Not surprisingly, the strongest correlation (.81) was between income-to-needs ratio and level of family income (sr), as they are both based upon the measure of income. These two variables were not used simultaneously in any of the multiple regression models, as one of the objectives of the study was to examine differences between these two measures.

When interpreting the bivariate relationships, one must bear in mind that the sample is homogeneous in nature, as all families were living in poverty. It is well known that "sample correlations may be lower than population correlations when there is restricted range in sampling of cases" (Tabachnick & Fidell, 2001, p. 57). The variance accounted for by the independent variable in the correlation is described using r^2 (Munro, 1997). Correlations between .00 and .25 are considered to have little if any strength, while correlations from .26 to .49 are considered to have low strength (Munro, 1997). Other researchers consider correlations from .38 - .50 as moderate in strength, and correlations of .80 as very high (Glass & Hopkins, 1996). With these guidelines in mind, the bivariate correlations are, in general, low to moderate in strength. Due to the decreased variability among observations, it is expected that the value of r observed here is also decreased. It is also important to note that exact p values are given as long as they are at or below the set significance level of p .05, as "reporting an exact p enables the readers of a research report to compare it with his or her own value of alpha" (Darlington, 1990, p. 250).

A positive statistically significant correlation between number of years of maternal education and income supported hypothesis 4a. Both level of family income (sr) (.45) and income-to-needs ratio (.46) relationships with maternal education were moderate in strength, explaining 20% and 21% of the variance in income respectively. Details about the remaining bivariate correlations are presented next with the multivariate analyses, for ease of comparing zero-order correlations to beta weights.

Table 5.4 *Correlation Matrix of all Key Variables*

Variables	1	2	3	4	5	6	7	8
1. MDI (square root)	--							
2.NCATS	.17	--						
3.CES-D	**-.27***	-.17	--					
	(.03)							
4.Level of Family Income	.16	**.25***	**-.25***	--				
(square root)		**(.03)**	**(.04)**					
5.Income-to-Needs Ratio	**.40***	**.43***	**-.30***	**.81***	--			
	(.002)	**(.001)**	**(.02)**	**(.000)**				
6.Maternal Education	-.001	**.37***	**-.24***	**.45***	**.46***	--		
		(.003)	**(.04)**	**(.000)**	**(.000)**			
7.Child Age	-.08	**.23***	.03	-.02	.02	.10	--	
		(.05)						
8.Child Gender	**.34***	.01	-.10	.20	**.32***	.21	.20	--
	(.007)				**(.01)**			

**p≤ .05 in parentheses beneath corresponding correlation.*

Testing the Hypotheses

The following section presents the results of the bivariate and multivariate analyses used to test the hypotheses. Due to the number of hypotheses, please refer to p. 60, which outlined the hypotheses as they are represented by the model, to assist in navigating through the results. As the results are presented please refer back to this diagram for clarity in regards to the hypothesis being tested and the relationships therein.

Income was represented by level of family income and income-to-needs ratio. The intent was to examine result differences based upon these two variables; therefore, two sets of multivariate analyses were carried out, one set for each hypothesized relationship with level of family income and one set for each hypothesized relationship with income-to-needs ratio. The models using *level* of family income are denoted with an (L), and the models using *income*-to-needs ratio are denoted with an (I).

Adjusted R^2 is reported, as this is considered a more conservative measure than R^2 for small sample sizes (Munro, 1997). In addition, squared semi-partial correlations, sr_i^2, are presented as they are considered one of the most appropriate ways to report the relative importance of IVs (Darlington, 1990; Tabachnick & Fidell, 2001). Tabachnick and Fidell (2001) caution that the type of interpretation of sr_i^2 differs based on the type of multiple regression employed. For standard multiple regression,

> "sr_i^2 for an IV is the amount by which R^2 is reduced if that IV is deleted from the regression equation. That is, sr_i^2 represents the unique contribution of the IV to R^2 in that set of IVs. When the IVs are correlated, squared semipartial correlations do not necessarily sum to multiple R^2. The sum of sr_i^2 is usually smaller than R^2 (although under some rather

> extreme circumstances, the sum can be larger than R^2). When the sum is smaller, the difference between R^2 and the sum of sr_i^2 for all IVs represents *shared variance*, variance that is contributed to R^2 by two or more IVS. It is rather common to find substantial R^2, with sr_i^2 for all IVs quite small." (Tabachnick & Fidell, 2001, p. 140, emphasis added).

Hypotheses 1a and 4b: Income, CES-D, and Maternal Education

Bivariate Findings

Support was found for hypothesis 1a at the bivariate level, as a statistically significant negative relationship was found between income and level of maternal depressive symptoms. The correlations between CES-D and both level of family income (-.25) and income-to-needs ratio (-.30) were low in strength. The correlation between income-to-needs and CES-D was slightly stronger negative correlation, accounting for 9% of the variance in maternal depressive symptoms versus 6% with level of family income (sr).

Hypothesis 4b was supported at the bivariate level as a significant negative association was found to be low in strength for maternal education and maternal depressive symptoms (-.24). Maternal education accounted for 6% of the variance in CES-D scores.

Multivariate Findings

Model one (L) and two (I) were not statistically significant; therefore, income (level of family income and income-to-needs ratio) and maternal education did not predict CES-D score. Therefore, hypothesis 1a and 4b were not supported at the multivariate level.

Hypotheses 1b, 2a, 4c, and 5a: Income, NCATS, CES-D, maternal education, and child age and gender

Bivariate Findings

Hypothesis 1b was supported at the bivariate level as a significant positive correlation was found between income and maternal-child interaction. A moderate relationship between income-to-needs ratio and NCATS (.43) explained 18% of the variance in maternal-child interaction scores. Although, the correlation between level of family income (sr) and NCATS was lower in strength (.25), explaining only 6% of the variance in NCATS scores.

Support was not found for hypothesis 2a at the bivariate level, as correlations did not provide a statistically significant negative association between maternal depressive symptoms and maternal-child interaction. Unexpectedly, the correlation between these two variables was small (-.17) and not statistically significant.

Evidence was found for hypothesis 4c at the bivariate level, as years of maternal education were significantly and positively associated with maternal-child interaction (.37). This low to moderate association explained 14% of the variance in NCATS scores. The positive correlation between child age and maternal-child interaction (.23) supported hypothesis 5a; however, the non-significant relationship between child gender and maternal-child interaction (.01) did not.

Multivariate Findings

Table 5.8 *Model Three: NCATS regressed onto Level of Family Income (sr), CES-D, Maternal Education, Child Age, and Child Gender*

Variables	B (unique)	Std. error	Beta weight	sr_i (part correlation)	t	p
Constant	37.36	6.61	--	--	5.65	.000
Level of family income (sr)	.03	.04	.13	.11	.87	.20
CES-D	.05	.09	-.09	-.08	-.62	.27
Maternal education	.92	.47	.30	.26	1.98	.03
Child age	.16	.09	.23	.22	1.70	.05
Child gender	-1.67	1.76	-.13	-.12	-.95	.17
R = .45						
R^2 = .21						
Adjusted R^2 = .12						
df = 5, 47; F = 2.4						
p = .05						

Model Three (L). Support was found for hypotheses 1b, 2a, 4c, and 5a from regression model three; wherein NCATS was regressed onto level of family income (sr), CES-D, maternal education, child age, and child gender. All predictors explained 12% of the variance in NCATS scores. The multiple correlation was significant at p= .05, indicating that all correlations with the DV were not zero.

Maternal education and child age were the only IVs that remained significant at .30 ($p = .03$) and .23 ($p= .05$) respectively. Controlling for all other IVs, maternal education decreased by .07 in strength from its zero-order correlation, while there was no change for child age. The relationships remain low in strength. In addition, a one-year increase in maternal education is associated with a .92 of a score increase in NCATS, and a one-month increase in child age is associated with a .16 of a score increase in NCATS – neither is clinically significant. Maternal education $sr_i^2 = .07$ and child age $sr_i^2 = .05$, which indicate the amounts both independently contributed to R^2 variance. Subtracting both sr_i^2 ($.07 + .05 = .12$) from R^2 (.21) gives .09, the amount of variance shared by all five IVs. All five IVs together explained less variance than maternal education and child age explained in independent variance. The beta weights for level of family income (sr), CES-D, and child gender were not significant. The zero-order correlation for level of family income (sr) .25 ($p= .03$) was reduced to non-significant .13, once all other IVs were controlled for. This indicates that it did not contribute independently to R^2 variance in NCATS score.

Table 5.10 *Model Four: NCATS Regressed onto Income-to-Needs Ratio, CES-D, Maternal Education, Child Age, and Child Gender*

Variables	B (unique)	Std. error	Beta weight	sr_i (part correlation)	t	p
Constant	37.36	5.56	--	--	6.72	.000
Income-to-needs ratio	14.28	5.37	.39	.33	2.66	.006
CES-D	-.02	.08	-.03	-.03	-.25	.40
Maternal education	.63	.44	.20	.18	1.44	.08
Child age	.16	.09	.24	.23	1.90	.03
Child gender	-2.63	1.70	-.20	-.19	-1.55	.06

$R = .55$

$R^2 = .30$

Adjusted $R^2 = .22$

df = 5, 47; F = 4.0

p = .004

Model Four (I). Support was found for hypotheses 1b, 2a, 4c, and 5a from regression model four; wherein NCATS was regressed onto income-to-needs ratio, CES-D, maternal education, child age, and child gender. All predictors explained 22% of the variance in NCATS score. The multiple correlation was significant at p= .004, indicating that all correlations with the DV were not zero. Income-to-needs ratio and child age were the only IVs that remained significant at .39 (p= .006) and .23 (p= .03) respectively. Income-to-needs ratio experienced a decrease of .04 in strength compared to its zero-order correlation, while the beta weight for child age increased by .01, once all relationships between various IVs and the DV were considered. The relationships remain low in strength.

A one-unit increase in income-to-needs ratio (1.0, or 100% of the LICOs) is associated with a 14.3-point increase in NCATS score, which is greater than one SD for every 1.0-point increase in the average income-to-needs ratio. Clinically, this could mean the difference between worrisome and non-worrisome NCATS scores. The slope for child age as associated with NCATS score was clinically insignificant. Income-to-needs $sr_i^2 = .11$ and child age $sr_i^2 = .05$, which are the amounts they independently contributed to R^2 variance. Subtracting both sr_i^2 (.11 + .05 = .16) from R^2 (.30) gives .14, the amount of variance shared by all five IVs. All five IVs together explained less variance than income-to-needs ratio and child age explained in independent variance. The beta weights for CES-D, child gender, and maternal education were not significant. However, maternal education approached significance at .20 ($p = .08$), but was reduced in strength compared to its zero-order correlations of .37 ($p = .003$), indicating that it did not contribute independently to R^2 variance in NCATS score.

Hypotheses 1c, 2b, 3, 4d, and 5b: Income, MDI, CES-D, NCATS, maternal education, child age and gender

Bivariate Findings

Support was found for hypothesis 1c, as the correlation between income-to-needs ratio and MDI (sr) (.40) was significant and moderate in strength, explaining 16% of the variance in MDI (sr). Conversely, the correlation between level of family income (sr) and MDI (sr) (.16) was not significant.

Hypothesis 2b was supported by a statistically significant negative association between level of maternal depressive symptoms and young children's cognitive development. A correlation between CES-D and MDI (sr) (-.27) was low in strength and explained 7% of the variance in MDI (sr).

Evidence was not found for hypothesis 3 that higher scores of maternal-child interaction go with higher scores of young children's cognitive development. Contrary to expectations, the correlation between these two key variables was (.17) and not statistically significant. Similarly, hypothesis 4d was not supported, as years of maternal education were not related to child cognitive development (-.001).

Hypothesis 5b was supported, as a significant positive association between child gender and young children's cognitive development (.34) was found. Alternatively, only a small non-significant correlation was found for child age and young children's cognitive development (-.08). The relationship between child gender and MDI (sr) was low to moderate in strength. The positive direction of the correlation indicates that females (coded 1 versus males code 0) had higher cognitive development scores. Twelve percent of the variance in MDI (sr) is attributed to child gender.

Multivariate Findings

Table 5.11 *Model Five: MDI (sr) Regressed onto Level of Family Income (sr), CES-D, NCATS, Maternal Education, Child Age, and Child Gender*

Variables	B (unique)	Std. error	Beta Weight	sr_i (part correlation)	t	p
Constant	2.57	1.63	--	--	1.58	.06
Level of family income (sr)	.003	.008	.07	.06	.46	.33
CES-D	.03	.02	-.22	-.21	-1.66	.05
NCATS	.05	.03	.24	.21	1.64	.05
Maternal education	-.14	.09	-.24	-.20	-1.54	.07
Child age	-.02	.02	-.18	-.17	-1.32	.10
Child gender	.96	.34	.38	.36	2.84	.004
$R = .50$						
$R^2 = .25$						
Adjusted $R^2 = .16$						
df = 6, 46; F = 2.6						
p = .03						

Model Five (L). Support was found for hypotheses 1c, 2b, 3, 4d, and 5b from regression model five; wherein MDI (sr) was regressed onto level of family income (sr), CES-D, NCATS, maternal education, child age, and child gender. All predictors explained 16% of the variance in MDI (sr). The multiple correlation was significant at p= .03, indicating that all correlations with the DV were not zero. Once all IVs had been controlled for the beta weight for CES-D decreased by .05 in strength at .22 (p= .05); NCATS increased .07 at .24 (p= .05) and became significant; and child gender remained significant at .38 (p= .007), an increase of .04 in strength. The relationships remain low in strength; further, because the child gender beta weight was larger than its zero-order correlation, it signifies that suppression occurred. Suppressor variables occur when "the partialled coefficients of X1 and X2 will be larger in value than the zero-order coefficients and one of the partialled (direct effects) coefficients may become negative" (Cohen & Cohen, 1983, p. 94).

The identification of the suppressor variable was attempted without success. Tabachnick and Fidell (2001) recommend systematically leaving out variables and watching what happens to IV's beta weights. If the beta weights are decreased when a specific variable is left out then it may be assumed that the variable is a suppressor variable. It is beyond the scope of this thesis to explore the matter further.

CES-D $sr_i^2 = .04$, NCATS $sr_i^2 = .04$; and child gender $sr_i^2 = .13$ are the amounts that each independently contributed to R^2 variance. Subtracting all sr_i^2 (.04 + .04 +.13 = .21) from R^2 (.25) gives only .04, a small amount of variance shared by all six IVs compared to the independent variance of CES-D, NCATS, and child gender. A change of one unit, in this case from 0 (male) to 1 (female) is associated with a .957 increase in MDI (sr). This equates to a MDI score of .92, which is not even a one score difference; thus, it is not clinically significant. Further, the slopes for CES-D and NCATS as associated with MDI were not clinically significant either.

Table 5.13 *Model Six: MDI (sr) Regressed onto Income-to-Needs Ratio, CES-D, NCATS, Maternal Education, Child Age, and Child Gender*

Variables	B (unique)	Std. Error	Beta Weight	sr_i (part correlation)	t	p
Constant	3.20	1.51	--	--	2.12	.02
Income-to-needs ratio	2.35	1.12	.33	.26	2.11	.02
CES-D	-.02	.02	-.18	-.17	-1.42	.08
NCATS	.03	.03	.13	.11	.91	.18
Maternal education	-.18	.09	-.30	-.25	-2.07	.02
Child age	-.02	.02	-.14	-.13	-1.1	.14
Child gender	.76	.34	.30	.28	2.25	.02
R = .56						
R^2 = .32						
Adjusted R^2 = .23						
df = 6, 46; F = 3.5						
p = .006						

Model Six (I). Support was found for hypotheses 1c, 2b, 3, 4d, and 5b from regression model six; wherein, MDI (sr) was regressed onto income-to-needs ratio, CES-D, NCATS, maternal education, child age, and child gender. All predictors explained 23% of the variance in MDI (sr). The multiple correlation was significant at p= .006, indicating that all correlations with the DV were not zero. Income-to-needs ratio and child gender remained significant once all relationships between the various IVs and the

DV were considered. Income-to-needs ratio was significant at .33 (p= .02), but decreased by .04 in strength from its zero-order correlation. Income-to-needs ratio sr_i^2 = .07, which is the amount it independently contributed to R^2 variance. Maternal education changed from non-significant in its zero-order correlation of -.001 to -.30 (p= .02). This drastic change in beta weight is due to a suppressor variable working in its favour. This relationship is in the opposite direction than was hypothesized. As I mentioned previously, I tried to determine which variable was the suppressor variable without success. It is beyond the scope of this thesis to explore the matter further.

Maternal education sr_i^2 = .06, which is the amount it independently contributed to R^2 variance. The beta weight for child gender was .30 (p= .02), a decrease of .04 in strength. Child gender sr_i^2 = .08, is the amount it independently contributed to R^2 variance. Subtracting all sr_i^2 (.07 + .06 + .08 = .21) from R^2 (.32) gives .11, the amount of variance shared by all six IVs, indicating that income-to-needs ratio, maternal education, and child gender explained more variance independently than all six IVs together. The beta weights for CES-D, NCATS, and child age were non-significant; thus they did not contribute independently to R^2 variance in MDI score. CES-D changed from a zero-order correlation of -.27 (p= .03) to -.18 and only approached significance, once all IVs were controlled.

A one-unit increase in income-to-needs ratio (1.0 or 100% of the LICOs) is associated with an increase of 2.4 MDI (sr). If 2.4 MDI (sr) is transformed back to MDI, it would equal 5.8 MDI increase for every 1.0-point increase in the average income-to-needs ratio ($\sqrt{5.8} = 2.4$). To illustrate, if a family's income was moved from the average income-to-needs ratio of this study (.62) up to 1.62 (162% of the LICOs), it would equate to a 5.8-score increase in MDI, 1/3 of a standard deviation, which is not clinically significant.

Norusis (1999) provided an example of converting a transformed slope back to its original number to interpret it; however, others maintain that the regression coefficients only apply to the transformed variable (Tabachnick & Fidell, 2001). The slopes for maternal education and child gender, as associated with MDI, were not clinically significant.

Multicollinearity

The possibility of multicollinearity between the two income variables (level of family income and income-to-needs ratio) and maternal education, although not detected in diagnostic tests, must be kept in mind. Multicollinearity may explain why income-to-needs ratio consistently had the highest standard error compared to other IVs (Tabachnick & Fidell, 2001). Alternatively, the higher scores of standard error may be attributed to the small sample because as sample size increases standard error decreases (Darlington, 1990). When multicollinearity is present, it makes it more difficult to find statistical significance, yet income-to-needs ratio was repeatedly significant. Regardless of standard error, the results are valid despite possible multicollinearity (Darlington, 1990). Further, multicollinearity may explain why in many instances, the zero-order correlations became non-significant beta weights in the multiple regression models (Norusis, 1999; Tabachnick & Fidell, 2001). In short, the SPSS program would have issued a warning had the IVs of been highly correlated (also see Mulitcollinearity and Singularity for further discussion).

Beta Weights

Are beta weights more telling than zero-order correlations as to the importance of a variable? Norusis (1999) states, “the values of beta coefficients [beta weights] still depend on the other IVs in your model so they do not reflect in any absolute sense the importance of the individual IVs” (p. 469). Regardless of the argument, income-to-needs ratio appeared to be a strong predictor in bivariate and multivariate analyses, which reinforces its importance.

Summary of Results

In summary, bivariate correlations indicate that income-to-needs ratio was the IV that best explained variance in all three DVs [CES-D, NCATS, and MDI (sr)]. The size and strength of all correlations are dependent upon sample size, and since the sample size is considered small, it is likely that had the sample been larger the strengths of correlations may have also been stronger (Darlington, 1990).

Only two of the multiple regression models were not significant, supporting 8 of 12 hypotheses. Due to the small sample size, the significant findings are strengthened, as large sample sizes invariably find significance (Tabachnick & Fidell, 2001). Overall, the models’ R^2 are not substantial in size; nonetheless, they are comparable to other research in this area.

Level of Family Income versus Income-to-Needs Ratio

Upon comparing multiple regression models (L) and (I), it is apparent that income-to-needs ratio significantly contributed to the R^2 variance of NCATS and MDI (sr), unlike level of family income (sr). The main difference between these two variables is that income-to-needs ratio, as its name suggests, takes need into account by considering the number of people provided for by the income. Income-to-needs ratio provides a measure of depth of poverty that level of family income cannot, which may explain why it was significant in most instances.

Owing to the non-significance of level of family income (sr) in the multiple regression models, other IVs emerged as significant. For example, in the Third Model (L), maternal education and child age were significant predictors of NCATS. Also, in Model Five (L) CES-D, NCATS, and child gender were significant predictors of MDI (sr). These findings suggest other IVs that are important in addition to depth of poverty, but ultimately when a standardized income variable is used, their importance diminishes.

In conclusion, the majority of the hypotheses based upon the model were supported by the findings, albeit at different levels of analysis. First, no support was found for hypothesis 2a, 5a (gender and NCATS only), and 5b (child age and MDI only). Hypotheses 1a and 4b had bivariate evidence for support. Hypothesis number 3 had multivariate support only, while 4d was found in the opposite direction at the multivariate level. Finally, two lines of evidence, from both bivariate and multivariate analyses were found in support of hypotheses 1b, 1c, 2b, 4a, 4c, 5a (child age and NCATS only), and 5b (child gender and MDI only). The discussion of these findings is presented in the concluding chapter.

CHAPTER 6: DISCUSSION

Like previous work, the results of the present study indicate that poverty negatively affects families' and children's health and well-being. Eight out of the 12 hypothesized relationships found support at the multivariate level, suggesting that the model may accurately depict the influences of poverty on mothers and their young children. The findings are consistent with Bronfenbrenner's (1993) human ecology theory and previous research, which indicate that negative environments negatively influence individuals (Duncan & Brooks-Gunn, 1997; Huston, 1991; Luthar, 1999; National Council of Welfare 2001a; National Forum on Health, 1997; Ross et al., 1996; Ross & Roberts, 1999; Wade et al., 1999). Thus, the findings point to specific environmental circumstances influencing families in specific ways. Further, the findings suggest that the family is influenced by the broader social context in which it is embedded, as the depth of poverty repeatedly had a negative affect on outcomes.

In this last chapter, the fit of the model with the data is described first. Next, the study's contributions to the fields of child development and health promotion are discussed. Then the study's external validity and limitations are treated. Finally, the implications of the findings for practice, policy, and future research are considered, followed by the conclusion.

Fit of The Model With Data

Poverty and Maternal Depressive Symptoms (Hypothesis 1a)

Maternal depressive symptoms were detected in children's impoverished environments. It is possible that a large proportion of the sample may be suffering from clinical depression, as over half of the sample (57%) had CES-D scores above 16, the cut-off score associated with clinical depression (Radloff, 1977). Consistent with the model, the bivariate results suggest that the deeper the poverty, the worse the mental health of mothers. The findings are similar to previous reports that poverty, which is associated with chronic conditions, frustrating situations, negative life stressors, and ambiguity of future survival, play a part in decreasing mothers' mental health (Belle, 1994; Halpern, 1993; McLoyd, 1990). The findings were expected given the large body of literature that indicates high levels of depressive symptoms among mothers living in low-income contexts (Coiro, 2001; Conger et al., 1992; Hall et al., 1985; Hope et al., 1999; Lyons-Ruth et al., 1986; McLoyd, 1990; McLoyd et al., 1994; Miller, 1998; Patten, 2001; Peterson & Albers, 2001; Williamson et al., 2001).

However, when the relationship was considered together with maternal education's influence, it did not remain significant. This outcome may be attributed to either the low strength of the relationship or the possible multicollinearity between income and maternal education.

Poverty and Maternal-Child Interaction (Hypothesis 1b)

The findings from bivariate and multivariate analyses revealed that the impoverished environment inhibited optimal maternal-child interactions. Like previous work, and in accordance with the model, the findings indicate that there is a negative association between poverty and optimal maternal-child interaction (Chase-Lansdale & Pittman, 2002; Clarke-Stewart, 1973; Halpern, 1993; Kelly et al., 1996; McLoyd, 1990; Ramey et al., 1979). This is consistent with Belsky's (1984) tenet that parenting is influenced by the broader social context in which both mother and child are embedded.

Based upon previous findings, the proportion of worrisome NCATS scores serves as a warning of future negative developmental outcomes (Beck, 1995; Beckwith & Rodning, 1996; Brooks-Gunn et al., 1999; Campbell, et al., 1995; Chase-Lansdale, et al., 2002; Clarke-Stewart, 1973; Field et al., 1990; Kelly et al., 1996; Klebanov, et al., 1998; Landry et al., 1997; Letourneau, 2001; Lyons-Ruth et al., 1986; Martinez, et al., 1996; Murray et al., 1993; NICHD, 1998; Parks & Smeriglio, 1986; Ramey et al., 1979; Smith et al., 1996). Nonetheless, it is interesting that the average NCATS score was higher than those found in two previous studies (Letourneau, 2001; Wallace et al., 1998); however, the samples differed from the current study's sample. Specifically, Letourneau's sample consisted of solely teenage mothers, while Wallace et al.'s sample was made up of women who were exclusively African American. Further examination of specific resources in the home environment that enable optimal maternal-child interaction is indicated.

Poverty and Young Children's Cognitive Development (Hypothesis 1c)

Consistent with previous work, the results of the present study indicate that low-income contexts negatively affect young children's cognitive development (Bacharach & Baumeister, 1998; Chase-Lansdale et al., 2002; Klebanov, et al., 1998; Landry et al., 1997; Liaw & Brooks-Gunn, 1994; Loham & Pittman, 2002; Miller, 1998; Murray, 1992;

NICHD, 1998; Petterson & Albers, 2001; Smith et al., 1997). More generally, the findings align with a large body of research indicating the negative effects of low income on children's overall development (Duncan & Brooks-Gunn, 1997; Huston, 1991; National Forum on Health, 1997; Ross et al., 1996; Wade et al., 1999). Similar to Garcia-Coll et al.'s (1998) findings, the majority of MDI scores were within normal range; however, the sample mean MDI score was below the norm of 100.

Studies have revealed that the longer poverty persists, the worse child developmental outcomes become (Luthar, 1999; Petterson & Albers, 2001; Smith et al., 1997). In this study, children 0-12 months of age had a higher MDI average than the children 12 months and over, possibly indicating that as children age in impoverished settings, their developmental outcomes become worse.

The below average MDI scores serve as a warning of the potential long-term effects of negative cognitive development outcomes for children in poverty, as MDI has been linked to later intelligence test scores (Bayley, 1993; Murray, Hipwell, Hooper, Stein, & Cooper, 1996). The "restricted range in [MDI] scores among *normal populations* limits the measure's ability to predict later intelligence" and as such, the MDI has been 'labelled' as having limited predictive value (Bayley, 1993, p. 6, emphasis added). In contrast, *at-risk populations* have provided enough variance in scores to establish correlations with later intelligence (Bayley, 1993; Murray et al., 1996). Thus, the current findings may predict later intelligence outcomes for young children in poverty.

As indicated by the model, income-to-needs ratio predicted the cognitive development of young children while taking into consideration maternal depressive symptoms, maternal-child interaction, maternal education, and child age and gender, which is interesting for two main reasons. First, the children were very young, some were born *only a few months prior* and the low levels of income had already negatively influenced their cognitive development. This may indicate that young children's cognitive development is sensitive to the poverty environment, even with limited exposure. Second, despite the fact that all family incomes were at or below the LICOs, which limited the variation in the income variable, a relationship still existed. Specifically, the linear relationship was found between income-to-needs ratio and young children's cognitive development. On the other hand, it was not found with level of family income, similar to Beckwith and Rodnings' (1996) findings.

Contrary to findings of two Canadian studies, an income gradient was found for the cognitive development of children in poverty (Kornberger, Fast, & Williamson, 2001; Ross & Roberts, 1999). Smith et al. (1997) found a 3.7-score increase in MDI with every one unit of increase in income-to-needs ratio (1.0); similarly, this study found a 5.8-score increase in MDI with every one unit of increase in income-to-needs ratio. Unlike the work of Smith et al. (1997), this income gradient was found for children younger than age 2. These findings contrast with Smith et al.'s (1997) speculation that the effects of income are very small at this age and that the MDI is not reliable until after age 1.

The most likely explanation for observing an income gradient may rest upon the fact that, unlike the study by Kornberger et al. (2001), this study did not include source of income in the multiple regression analyses. Income and source of income may confound each other, as people living in working poor families tend to have higher levels of income than people living in families receiving social assistance (Kornberger et al., 2001). Thus, the income variable may have become non-significant in findings by Kornberger et al. (2001) because it was already at work in the variable measuring source of income, leaving none of the variance for the income variable to claim. Future Canadian studies are needed to verify the income gradient among low-income populations.

This study's findings about income and cognitive development challenge psychologists who espouse that sensori-motor development is determined to a greater extent by genetics than environmental influence (Cicchetti & Wagner, 1990; McShane, 1991). Clearly, the 'maturation' hypothesis, which emphasizes bio-physical development, believed to be unaffected by environmental influences, was not supported, as a negative relationship existed between depth of poverty and children's cognitive development for children as young as 4-36 months of age.

Maternal Depressive Symptoms and Maternal-Child Interaction (Hypothesis 2a)

In this study no correlation was found between CES-D and NCATS, in contrast to previous work that found a negative relationship between depressive symptomology and maternal-child interaction (Beck, 1995; Campbell et al., 1995; Chase-Lansdale & Pittman, 2002; Field et al., 1990; Lyons-Ruth et al., 1986; Martinez et al., 1996; McLoyd, 1990; Murray et al., 1993). In addition, these findings do not support Belsky's (1984) tenet that parent characteristics (i.e. CES-D score) influence parenting more than the surrounding social context (i.e. income-to-needs ratio). A previous study also reported a non-significant relationship between CES-D and NCATS (Sumner & Spietz, 1994). The authors speculated that because the NCATS is such a short assessment, even depressed mothers were briefly able to interact optimally (Sumner & Spietz, 1994). This speculation may hold for the current study's findings as well. Further studies are needed to verify this relationship, that to-date, has had mixed findings.

Maternal Depressive Symptoms and Young Children's Cognitive Development (Hypothesis 2b)

The bivariate results and one of the multiple regression models, which included level of family income as an IV, show that elevated levels of maternal depressive symptoms may stifle children's cognitive development. The influence of living with a mother experiencing depressive symptoms may inhibit cognitive development from reaching its potential, possibly due to decreased cognitive stimulation resulting from mothers' fatigue or irritability. CES-D scores above the cut-off of 16 and below-average MDI scores align with and extend the findings of one Canadian study that found maternal depression had increased the chances of cognitive developmental delay (Byrne et al, 1998).

In accordance with other studies, maternal depressive symptoms were found to have a negative relationship with young children's cognitive development in multivariate analyses (as specified above), when other influencing factors were considered (Liaw & Brooks-Gunn, 1994; Lyons-Ruth, et al., 1986; Miller, 1998; Petterson & Albers, 2001). These findings stand in contrast to one Canadian study that did not find a relationship between a short-form of the CES-D and young children's cognitive development (Williamson et al., 2002).

Throughout the multivariate analyses, the level of income was a weaker predictor than income-to-needs ratio, and thus allowed CES-D to emerge as a predictor of MDI. In the multiple regression model with income-to-needs ratio, the relationship did not persist, indicating that the depth of poverty may be more influential than CES-D in predicting MDI.

Maternal-Child Interaction and Young Children's Cognitive Development (Hypothesis 3)

In contrast to Wallace et al. (1998), this study found a significant relationship between NCATS and MDI at the multivariate level (in the multiple regression model that used level of family income as an IV), as a result of over half the sample having worrisome maternal-child interaction scores and below average cognitive development scores. The results of this study are consistent with considerable previous work, which indicates that maternal-child interaction influences cognitive development (Beck, 1995; Beckwith & Rodning, 1996; Brooks-Gunn et al., 1999; Campbell, et al., 1995; Chase-Lansdale, et al., 2002; Clarke-Stewart, 1973; Field et al., 1990; Kelly et al., 1996; Klebanov, et al., 1998; Landry et al., 1997; Letourneau, 2001; Lyons-Ruth et al., 1986; Martinez, et al., 1996; Murray et al., 1993; NICHD, 1998; Parks & Smeriglio, 1986; Ramey et al., 1979; Smith et al., 1996).

The multiple regression model included level of family income, maternal depressive symptoms, maternal education, and child age and gender, known to influence cognitive ability, in addition to maternal-child interaction. Again, since level of family income was found to be a weaker predictor compared to income-to-needs ratio, it allowed NCATS to emerge as a predictor of MDI. Thus, in the multiple regression model with income-to-needs, the relationship did not persist, indicating that the depth of poverty is more influential in predicting MDI than is NCATS.

Maternal Education and Income (Hypothesis 4a)

Maternal education and income were correlated as expected, similar to previous findings (Jackson & Huang, 1998). This finding suggests that mothers in the sample that were employed and also had higher education may have been able to access higher paying employment, since income increased along with years of formal education.

Maternal Education and Maternal Depressive Symptoms (Hypothesis 4b)

Findings from an ANOVA showed statistically significant differences in level of maternal depressive symptoms between mothers with and without high school education, while no differences were detected for mothers with post-secondary education. This finding was unexpected, but may be attributed to stressors originating from post-secondary education not providing the level of income hoped for, or the inability to continue studying or working due to childrearing. This deserves further study.

The bivariate correlation between maternal education and CES-D score was significant and in the predicted direction, similar to previous work (Jackson & Huang, 1998; Naerde et al., 2000). Nonetheless, when maternal education was considered together with other influences on CES-D, it did not remain significant. Possible multicollinearity between income and maternal education may have prevented significant findings in the multivariate analyses. Subsequent studies may need larger, heterogenous samples to increase maternal education variability, to verify this relationship.

Maternal Education and Maternal-Child Interaction (Hypothesis 4c)

Similar to previous work, bivariate and multivariate findings (the multiple regression model that used level of family income as an IV) showed that as maternal education increased so did optimal maternal-child interaction (Chase-Lansdale &

Pittman, 2002; VanBakel & Riksen-Walraven, 2002). This may be attributed to increased intelligence or greater skills learned from educational institutions. Both intelligence and skills may aid in effective interactions and assist in devising creative ways of interacting with the children (Letourneau, 2001). Maternal education significantly predicted NCATS as hypothesized, although it was not as strong of a predictor as depth of poverty, as maternal education only approached statistical significance (p = .08) in the multiple regression model that included income-to-needs ratio as an IV.

Maternal Education and Young Children's Cognitive Development (Hypothesis 4d)

A negative relationship between maternal education and MDI score was found once other influencing factors were considered, opposite to the hypothesized positive relationship, making the findings inconsistent with previous work in the child development field (Brooks-Gunn et al., 1999; Liaw & Brooks-Gunn, 1994; Van Bakel & Riksen-Walraven, 2002). Nevertheless, all three of the samples from previous studies included families with heterogenous income, not strictly families in poverty.

The direction of the relationship raises questions about the relationship between maternal education and children's cognitive ability in impoverished samples. A variety of speculations can be made for this unusual finding. It may be that mothers with more education in the sample had to spend time away from their child to acquire it, leaving less time for cognitive-stimulating interaction with the child. Or, impoverished mothers with higher education may feel frustrated and disappointed by the failure of their education to translate into higher paying employment. Their frustration/disappointment, may in turn negatively influence their interactions with their children, creating a negative environment for the child's cognitive development (Dr. D. Williamson, personal communication, April 24, 2003). It also can be speculated that the generally low educational attainment in this sample explains, in part, the negative relationship between maternal education and cognitive ability, as 60% of the sample had high school or less than high school education. In other studies' a positive influence of maternal education on cognitive development was found, but the samples had a greater range of maternal education (Liaw & Brooks-Gunn, 1994; Petterson & Albers, 2001; Van Bakel & Riksen-Walraven, 2002). Finally, as shown by the ANOVA comparing CES-D score by years of formal education, mothers with post-secondary education had a higher CES-D mean as a group than mothers with strictly high school education. Thus, it may also be surmised that the increased depressive symptoms in the higher educated group negatively influenced their children's cognitive development (Dr. N. Letourneau, personal communication, May 28, 2003). Future research is required to find out more about the relationship between maternal education and impoverished children's cognitive development.

Child Age and Gender and Maternal-Child Interaction (Hypothesis 5a)

Bivariate analyses showed that child age was positively related to NCATS score, similar to what Sumner and Spietz (1994) reported. Further, once other influences were considered with child age in the multivariate analyses, age remained related to maternal-child interaction. The influence of child age on NCATS may be attributed to the fact that as the infant matures, a greater repertoire of cues and responses are established between mother and child in interactions. This finding supports the tenet of bi-directional influences espoused by Bronfenbrenner's (1993) human ecology theory.

Incidentally, child gender did not influence the maternal-child interaction, which appears to be a positive finding for children in general. This finding suggests that mothers are not favouring their daughters or their sons in interactions, treating each equally in parenting interactions.

Child Age and Gender and Young Children's Cognitive Development (Hypothesis 5b)

Like previous work, the results of the present study also show gender differences in cognitive developmental outcomes (Murray, 1992; Murray et al., 1993; Petterson & Albers, 2001). In contrast, the model hypothesis was not supported for the relationship between child age and child cognitive development scores.

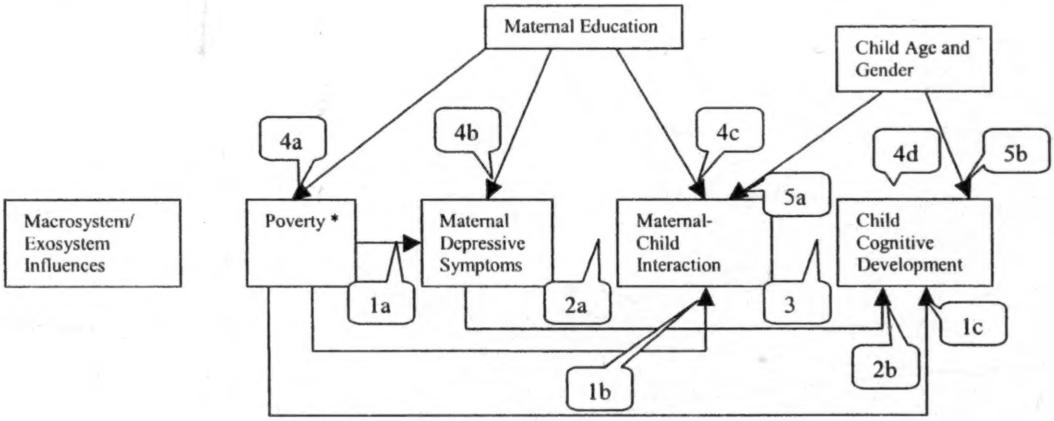
The mean for MDI scores for males was below the norm, while the mean for females was at the norm, and in the multivariate analyses, with the effects of income held constant, gender still remained significant. These findings suggest that boys are more negatively influenced by poverty than girls, which is similar to what the Kauai Longitudinal Study found (Werner & Smith, 1992, 2001). The Kauai study reported that girls were more resilient in the face of adversity than their male counterparts. In this longitudinal study, more males developed serious learning problems than females (Werner & Smith, 1992, 2001). However the mechanisms through which this difference occurs is not well understood. Further research is needed to answer questions that these findings raise: Why do impoverished boys have lower cognitive development scores than impoverished girls? Is it possible that the poverty environment is more negative for boys than girls? Or do boys interact differently with their environment, which predisposes them to more negative outcomes than girls? This study's findings must be considered in light of the fact that social and cognitive development occurs for males and females at different rates (Archer, 1981). The findings suggest that this difference may begin at a very early age for cognitive development.

Summary

Objective number one. Bivariate correlations were found for the majority of the relationships illustrated by the model (see Figure 3). Consistent with the model, evidence from the multiple regression analyses shows that depth of poverty, maternal depressive symptoms*, maternal-child interaction*, and child gender predict young children's cognitive development (see Figure 4). Inconsistent with the model, maternal education was negatively associated with young children's cognitive development, but only in the multiple regression model that included income-to-needs ratio as an IV. Further, depth of poverty, maternal education*, and child age significantly predict maternal-child interaction (see Figure 4).

* Only in multiple regression models that utilized level of family income as an IV.

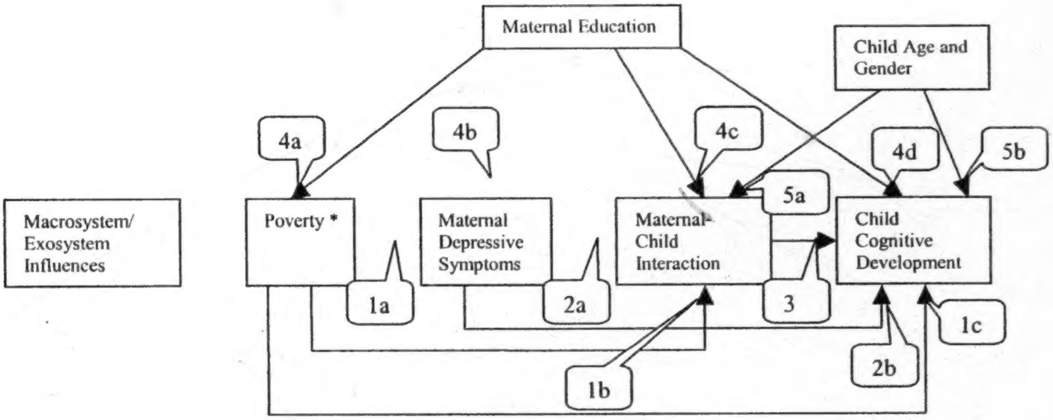
Figure 3. The Model With Hypotheses Supported at the Bivariate Level


Maternal Education
Child Age and Gender
4a
4b
4c
4d
5b
5a
Macrosystem/ Exosystem Influences
Poverty *
Maternal Depressive Symptoms
Maternal-Child Interaction
Child Cognitive Development
1a
2a
3
1c
2b
1b

** Poverty = level of family income and income-to-needs ratios (depth of poverty)*

Note: hypothesis 5a was supported in terms of child age, and hypothesis 5b was supported in terms of child gender.

Figure 4. The Model With Hypotheses Supported at the Multivariate Level


Maternal Education
Child Age and Gender
4a
4b
4c
4d
5b
5a
Macrosystem/ Exosystem Influences
Poverty *
Maternal Depressive Symptoms
Maternal-Child Interaction
Child Cognitive Development
1a
2a
3
1c
2b
1b

** Poverty = level of family income and income-to-needs ratios (depth of poverty)*

Note: hypothesis 4d was not supported, as the association was in the opposite direction; however, a relationship was supported at the multivariate level; hypothesis 5a was supported in terms of child age, and hypothesis 5b was supported in terms of child gender.

Objective number two. The correlations indicate that level of family income and income-to-needs ratio (two different measures of poverty) yielded different results. The pattern of correlations among key variables and income variables indicates that the income-to-needs ratio variable was a significant predictor more often than the variable measuring level of family income. Specifically, many of the supported hypotheses regarding poverty included the income-to-needs ratio variable rather than the level of family income variable. At the bivariate level of analyses, income-to-needs ratio best explained variance in maternal depressive symptoms, maternal-child interaction, and young children's cognitive development. At the multivariate level, income-to-needs ratio significantly contributed to the variance in maternal-child interaction and young children's cognitive development, unlike level of family income.

Income-to-needs ratio is a better predictor for two reasons. First, income-to-needs ratio considers the number of people in the family who share the income, which makes the level of income more meaningful. For example, there is a large difference in terms of the amount of resources available to five people with an $18,000 income compared to the resources available to two people with an $18,000 income. This suggests that when working with a sample that is homogenously poor, the income-to-needs ratio may be a better choice of income measurement, rather than strictly using the level of family income.

Contribution to the Field of Child Development

This study extends the findings from other studies that have examined children's development in the context of poverty, in four ways (Chase-Lansdale & Brooks-Gunn, 1995; Duncan & Brooks-Gunn, 1997; Huston, 1991; Luthar, 1999; McLoyd, 1990; Ross & Roberts, 1999; Ross et al., 1996). First, it focused on a sample of Canadian children, which is infrequent. Second, the children were 0-3 years of age, which is younger than the majority of previous research samples. Third, the study uniquely focused on children's cognitive development, which is rare for a Canadian study. Fourth, unlike many previous studies, this study included the key variables of income, maternal depressive symptoms, maternal-child interaction, and children's cognitive development, while also considering maternal education, child age, and gender altogether in one study. Most previous research examined only one or two of the key variables per study. While the findings, keeping in mind the previously stated caveats, support previous child development research that has shown that depth of poverty, maternal depressive symptoms, maternal-child interaction, and child gender independently influence young children's cognitive development, this study raised questions about the role of maternal education in the cognitive development of impoverished children.

The answer to the question posed earlier, 'is Canada's poverty environment less harsh than in other countries?' (see p. 31), appears to be no. Canada's poverty environment does predispose young children's development to negative influences, similar to what studies in other countries have shown (Duncan & Brooks-Gunn, 1997; Lyons-Ruth et al., 1986). In this study, unsatisfactory outcomes for young children's NCATS and MDI scores were found within a sample of families whose incomes ranged from $6,479 – 37,824 and income-to-needs ratios ranged from .30 to 1.00 of the LICOs. In fact, an income gradient was found for young children's cognitive development similar to previous studies, but the main difference is that this sample included only low-income families as opposed to families with diverse income levels.

Similar to other studies (Bacharach & Baumeister, 1998; Klebanov et al., 1998; Landry et al, 1997; Liaw & Brooks-Gunn, 1994; NICHD, 1998; Smith et al., 1997), data from the MDI, a professionally administered instrument, yielded a negative relationship between poverty and children's cognitive development. Taken together, these findings may suggest that professionally administered instruments are more sensitive to the influence of poverty on cognitive development than parent-report instruments.

Contribution to the Field of Health Promotion

Human Ecology and Health Promotion

Human ecological theory has influenced health promotion, evident in a definition of health "as a product of interdependence between the individual and subsystems of the ecosystem" (Green et al., 1996, p. 27). The quality of the surrounding environment depends upon its ability to provide resources that are conducive to health, and these resources have been referred to as the determinants of health (CPHA, 1996). Income is one determinant of health in particular that many agree upon (CPHA, 1996; Federal, Provincial, and Territorial Advisory Committee on Population Health, 1994; Jakarta Declaration, 1998; Ottawa Charter, 1986).

In health promotion, there is a focus on reducing health inequalities that are associated with income and social standing (CPHA, 1996; Epp, 1986; Federal, Provincial and Territorial Advisory Committee on Population Health, 1994, 1996; Hamilton & Bhatti, 1996; Labonte, 1993; Reutter, 1995; Rootman & Goodstadt, 1996; World Health

Organization [WHO], 1986). Consequently, "concern about levels of health among children and their prospects for normal development have been exacerbated by growing recognition of the debilitating influences of socio-economic inequality" (Boyle & Willms, 2002, p. 462). Since the family environment is not isolated, but is inextricably linked to social, economic, and political environments that surround it (Bronfenbrenner, 1993; Canadian Public Health Association [CPHA], 1996; Green et al., 1996), society ought to be concerned with optimal child development, versus merely placing responsibility at the individual family level (CPHA, 1996; Federal, Provincial and Territorial Advisory Committee on Population Health, 1994; WHO, 1986).

Income As a Determinant of Health

First and foremost, in accordance with previous health promotion literature, the role of income (depth of poverty) as a determinant of health has been demonstrated once again by the current study's findings (Epp, 1986; Federal, Provincial and Territorial Advisory Committee on Population Health, 1994, 1996; Hamilton & Bhatti, 1996; Murray & Lopez, 1996; WHO, 1986). This study's univariate and bivariate findings were in accordance with previous research that examined impoverished mothers' mental health (Belle, 1984; Byrne et al., 1998; Coiro, 2001; Heymann & Earle, 1999; McLoyd, 1990). In particular, 57% of the mothers in this impoverished sample had depressive symptom scores above 16, indicating clinically significant levels and that maternal mental health decreased with greater depths of poverty. Using contextual thinking, it is possible to link the low-income environment to increased risk of depressive symptoms, which assists in understanding why mothers living in poverty have increased levels of depressive symptoms compared to those with adequate incomes.

Healthy Child Development as a Determinant of Health

The study findings also demonstrate income's ability to predict another determinant of health, young children's development. Depth of poverty predicted the cognitive development of children as young as 4-36 months of age, while taking into consideration factors known to influence cognitive ability (i.e. maternal depressive symptoms, maternal-child interaction, etc.).

Young children's cognitive development in the first 6 years is associated with long-term health and intelligence (Bayley, 1993; Federal, Provincial and Territorial Advisory Committee on Population Health, 1994, 1996; Hertzman, 1998; Hertzman & Wiens, 1996; Murray et al., 1996). The below average MDI score found as the sample mean provides a warning of future outcomes for young children living in poverty. To illustrate, cognitive development plays an extremely important role in processing information, which is becoming increasingly significant together with the capacity "to master new technologies [and] thrive in a knowledge-based society" (Jenson & Stroick, 1999, p. 11). Individual levels of achievement hindered by cognitive developmental delays in childhood may inhibit employment opportunities for jobs that provide 'living wages', decreasing the chance for escape from poverty. As a result, the long-term consequences of these findings could be detrimental to society if individuals are unable to contribute to an economy that is dependent on intellectual capital (Federal, Provincial and Territorial Advisory Committee on Population Health, 1994, 1996; Frank, 1995; Hertzman, 1998; Keating & Hertzman, 1999; National Forum on Health, 1997).

Since children's health and development is crucial to their long-term levels of health, coping, and competence, it is prudent that actions be taken now to enhance impoverished children's cognitive development. An ounce of prevention is worth a pound of cure, as it is well known that preventative measures are more cost effective than remedial ones (Federal, Provincial and Territorial Advisory Committee on Population Health, 1996; Lalonde, 1974; Luthar, 1999; National Forum on Health, 1997).

External Validity

The sample in this study was isolated to one city in Western Canada; however, the socio-demographics are comparable to other studies that have examined families in poverty. For example, the average number of years of formal maternal education was comparable to other samples of mothers living in poverty (Beckwith & Rodning, 1996; Kornberger et al., 2001; Smith et al., 1997; Wallace et al., 1998; Williamson et al., 2002). Of course, the level of income was determined by the LICOs, and other studies have also used the LICOs as inclusion criteria (Kornberger et al., 2001; Ross & Roberts, 1999). The sample's income-to-needs ratio average was similar to that found in a Canadian national sample that also examined families in poverty (Kornberger et al., 2001). Generalizability is limited to young children 0-3 years of age and single-mothers living in poverty in Canada.

Limitations

Despite the significant findings, causation cannot be shown. The study is non-experimental in nature with a cross-sectional design, without a control group or a random sample, all of which preclude the possibility of assigning causation to the findings. Nevertheless, causal relationships cannot be ruled out -- there is a possibility that the relationships among depth of poverty, maternal depressive symptoms, maternal-child interaction, and young children's cognitive development are causal. First, many previous research findings were supported by the current study's findings. Second, logical reasoning suggests that family poverty precedes maternal-child interaction and child cognitive development, and not that maternal-child interaction and child cognitive development influence poverty. However, it must be conceded that maternal depressive symptoms may have been a precursor to poverty (Coiro, 2001; Patten, 2001).

Children with diagnosed developmental delay were excluded from the sample to control for influences on maternal-child interaction and MDI scores; therefore, there may be higher levels of developmental delay among impoverished children than this study suggests. There are many confounding variables that were not included because they were either not measured, omitted due to sample size, or are unknown. For instance, confounding variables such as prenatal health of the mother, family structure, neighbourhood safety, social support, nutrition, infant birth weight, or pre-maturity were not included in this study (Brooks-Gunn & Duncan, 1997; Liaw & Brooks-Gunn, 1994; Wachs, 1996). Likewise, only a select few independent variables from the microsystem were taken into consideration. Therefore, in view of this study's findings, one must keep in mind the possibility of other explanations involving the excluded confounding variables stated above. For instance, low levels of social support may explain the levels of maternal depressive symptoms (Belsky, 1984). Also, maternal physical health may have influenced maternal-child interactions (Chase-Lansdale & Pittman, 2002). (For further information regarding potential confounding variables, please see the review by Brooks-Gunn and Duncan, 1997.)

The size and strength of the relationships, through which poverty influences mothers and their young children, were examined, but their strength and significance depends upon the size of the sample to some extent, which increases the variability in scores (Tabachnick & Fidell, 2001). There is a possibility that with greater variance in income, stronger and more significant relationships may have been found.

In regards to significance testing, one-tailed tests were employed versus more conservative two-tailed tests (Gravetter & Wallnau, 1999; Munro, 1997). This was to maintain clarity and consistency, as all but hypothesis number five was assigned a direction. In examining the two-tailed tests involving the variables specified in hypothesis 5, there were mild differences in levels of significance overall; however, as a two-tailed test, child age approached significance, but with a one-tailed test child age became a significant predictor of maternal-child interaction.

There are limitations to quantitative research and analyses in general, as it is not a perfect 'way of knowing'. First of all, the study variables were measured from pre-determined standards that may be biased. For example, the standards for maternal-child interaction may be culturally biased and possibly not suitable for all cultures included in the sample (Edgar, 1995). Additionally, social scientists are acknowledging more and more that the experiences of individuals are important to consider outside of pre-determined questions and assessment instruments that are typical of quantitative research (Bray, Lee, Smith, & Yorks, 2000; Heron & Reason, 1997).

Implications for Policy

Supportive Environments

Despite the study's limitations, the results suggest a need to provide environments that are conducive to maternal mental health, maternal-child interaction, and young children's cognitive development - supportive environments. Creation of supportive environments is called for by various health promotion documents (Green et al., 1996; Hamilton & Bhatti, 1996; WHO, 1986). Thus, in light of the current study findings, the following supportive environments are implicated.

Supportive Environments for Maternal Mental Health

Canadian women living in poverty may be suffering from clinical depression, as the majority (57%) of the women in this study had levels of maternal depressive symptoms associated with clinical depression (Radloff, 1977). A supportive environment for maternal mental health may include decreasing stressors associated with poverty by providing adequate income from benefits or wages, along with provision of accessible treatment and service options for depression (Coiro, 2001; Naerde et al., 2000). Financial support has been shown to buffer psychological stress among unemployed adults, which provides evidence that income works both to increase and decrease mental health (Kessler, House, & Turner, 1987a). A supportive environment such as this may also facilitate young children's cognitive ability, as this study, along with previous research, found that maternal depressive symptoms inhibited children's cognitive growth.

Maternal depressive symptoms of mothers living in poverty must be taken into consideration, since they may impede employment (Coiro, 2001). Welfare-to-work policy that demands mothers with children over 6 months of age to engage in the labour market or in employment-related activities may not be appropriate for such women (Kornberger et al., 2001). Thus, a supportive environment that decreases stressors may include the choice to either stay home and care for children, pursue further education, take part in the labour market, or a combination of these (Beauvais & Jenson, 2001). Access to high-quality daycare facilities and flexible employment that allow mothers to attend to child-rearing issues are two supports necessary for employed mothers (Jenson & Stroick, 1999). Additionally, adequate wages with benefits may decrease stress, especially in terms of balancing family and work, by decreasing the need for parents to work long hours away from children and providing means to secure high-quality childcare.

Supportive Environments for Higher Education

Maternal education was found to be positively associated with income. The finding may be attributed to the ability women have to access higher paying employment with more education (for those women that were employed in the sample). For this reason, supportive environments that increase access to educational opportunities are also important.

Supportive Environments for Maternal-Child Interaction

Since depth of poverty was found to decrease NCATS scores, a supportive environment may include the adequate resources necessary to facilitate optimal maternal-child interaction. For example, a range of materials and experiences are suggested to facilitate cognitive-stimulating interactions (Sumner & Speitz, 1994). Additionally, the resource of time is needed for mothers to interact with children. It is thought that differences in these resources from low, middle or higher income families may explain the social class differences in maternal-child interaction (McLoyd, 1990). Therefore, decreasing families' depth of poverty may increase optimal maternal-child interaction.

This study's findings also suggest that access to educational institutions, which increase knowledge and skills, may aid in increasing levels of optimal mother-child interactions. Alternatively, parenting programs that educate mothers about methods to facilitate optimal maternal-child interaction, such as the 'Keys to Caregiving' program, may also support optimal interactions with children (Clarke-Stewart, 1973; Letourneau, 2001; Parks & Smeriglio, 1996; Sumner & Spietz, 1994). Consequently, it is possible that supporting optimal maternal-child interaction will also increase young children's cognitive development, as this study (keeping the previously discussed caveats in mind), along with previous research, found that maternal-child interaction predicted young children's cognitive ability.

Supportive Environments for Young Children's Cognitive Development

Depth of poverty was the most consistent predictor in both bivariate and multivariate analyses, and as such, the findings point to the negative effect of depth of poverty on young children's cognitive development. A supportive environment for young children's cognitive ability includes decreasing the depth of poverty for families (Boyle & Willms, 2002). Ross and Roberts (1999) assert that family incomes that are 120% of the current LICOs are necessary to decrease the risks of poor developmental outcomes. Clearly an increase in family income would provide a supportive environment for cognitive development, which, according to this study's findings and previous research, appears to be especially important for male children (Werner & Smith, 1992, 2001).

Healthy Public Policy for Supportive Environments

Healthy public policy has "an explicit concern for health and equity in all areas of policy, and an accountability for health impact" (Rootman & Goodstadt, 1996, p. 7). Healthy public policies that reduce poverty and the negative effects of poverty are needed in order for concerns pertaining to health and impacts on health to be realized (Raphael, 2000b). Therefore, building healthy public policies that focus on increasing income equality is key in promoting health and building supportive environments for maternal mental health, maternal-child interaction, and young children's cognitive development (CPHA, 1996; Epp, 1986; Hamilton & Bhatti, 1996; WHO, 1986).

Brooks-Gunn et al. (1999) suggest three policy initiatives to increase income equality in the United States that also may be useful in Canada: 1) provide more generous transfer payments (to provinces and territories); 2) change tax policy; and 3) change the minimum wage. These initiatives are supported by other policies put forth by the Canadian Council on Social Development (2001b). All three initiatives would involve income redistribution through the Canadian tax system, both federal and provincial transfers, and the social safety net (Raphael, 2000b). If policies that determine the level of social assistance benefits and the minimum wage were altered to increase family income, the result may be buffered maternal psychological stress (Kessler et al., 1987a), increased optimal maternal-child interaction (Kelly et al., 1996; Ramey et al., 1979), and increased cognitive development of young children (Brooks-Gunn & Duncan, 1997).

Further, the National Council of Welfare (2001b) suggests that there is a need for comprehensive and multi-faceted policies that support low-income families, reflective of a human ecological approach, wherein the interconnectedness between systems and their impact on the family is realized (Bertrand, 1998; Bronfenbrenner, 1993). Consequently, the National Council of Welfare also suggests that policy-makers consider the family unit by focusing policies on the areas of labour, income support, employment equity, education, childcare, and early childhood education, in order to defeat poverty. Thus, the support would reach beyond providing children's basic needs to encompass a holistic view of people and their health within their families and society. The policies' aim would be to provide an environment for successful living that allows people to contribute to society, in essence a supportive environment (National Council of Welfare, 2001b).

Current Programs and Gaps

All four supportive environments mentioned above indicate the need for healthy public policy focused on income redistribution. In this regard, the pre-tax poverty gap, which is the amount required to bring all Canadians above the poverty line, was over $18 billion in 1999 (National Council of Welfare, 2002), which according to some, is not an insurmountable feat (National Council of Welfare, 2001a). Recently, the estimated resources for family assistance (including Family Allowance, Family Tax Benefit, Family Tax Payment, Childcare Assistance, Childcare Rebate, and Child Care Benefit) totalled about $10 billion in the 2000-2001 budget, which is about $8 billion short of the estimated poverty gap (Battle & Mendelson, 2001).

Currently, the Canada Child Tax Benefit provides a federal, non-taxable, monthly benefit to families with children younger than 18 years of age, which is in alignment with income redistribution (Battle & Mendelson, 2001). This program is income-tested and pays maximum amounts of money to families with the lowest income. Unfortunately, "income supplements and child benefits will have to be higher than they currently are if families who depend on combining them with very low incomes are to be able to climb out of poverty" (Beauvais & Jenson, 2001, p. 28).

Supportive environments for maternal mental health also have gaps. In Alberta, the Alberta Health Care Insurance Plan does not cover service options for depressive symptoms, such as visiting a clinical psychologist. In addition, families with low incomes that are above Alberta Health's established cut-offs may not qualify for health care benefit plans that cover prescription medication, which may be indicated to treat depression (Alberta Health, 2003; Stuart & Sundeen, 1995). Further, the current environment does not protect against stressors that exacerbate maternal depressive symptoms of employed mothers. For example, there is a lack of space in appropriate childcare services and there are few opportunities for flexible work hours and schedules (Jenson & Stroick, 1999).

There are also gaps in the current environment to support access to higher education for mothers. In Alberta, the Alberta Human Resources and Employment provides career and education counselling, job information, employment referrals, employment planning, assessment, orientation workshops on local resources, and financial supports for continuing education (in conjunction with Alberta Learning) (Gorlick & Brethour, 2001). Nonetheless, a "work first" approach is in place that emphasizes the need to work regardless of the suitability of the wage for family sustenance. Welfare-to-work policy outlines provisions for educational upgrading, but individuals must meet eligibility criteria (Gorlick & Brethor, 2001), consisting of whether or not an individual can attain employment – any employment! Individuals who meet eligibility criteria may receive student grants to complete high school, but they are expected to take on student loans to attain post-secondary education. In short, many women do not have access to education because they are not 'eligible' or cannot afford to take on debt.

Supportive environments for optimal maternal-child interaction and young children's cognitive development require early childhood intervention and parent-child interaction education (Letourneau, 1997; Sumner & Spietz, 1994; Ramey et al., 1979). Select Canadian communities offer the Community Action Program for Children (CAPC), an early intervention initiative, which provides funding to community agencies to offer programs to young at-risk children. However, according to Boyle and Willms (2002) there are no statistically significant increases in health of those involved in the programs compared to an NLSCY control group, which reinforces the need for adequate family incomes in conjunction with intervention programs.

Parenting programs such as 'Parents as Teachers' (Parents as Teachers [PAT], 2003), 'Keys to Caregiving' (Sumner & Speitz, 1994), 'Right from the Start' (Niccols, 2003), and 'Better Beginnings, Better Futures' (Peters, 2003) provide parents with parent-child interaction skills and child development information. The 'Right from the Start' program, offered in Ontario, is accessible to all parents since it is free and provides free parking, bus tickets, and on-site childcare (Niccols, 2003). In Alberta, there are 15 'Parents as Teachers' programs, although some have enrolment restrictions (PAT, 2003); therefore, these restrictions and those for other parenting programs may inhibit parents' access to parenting programs in Alberta.

Summary and Conclusions Regarding Current Programs

Those concerned with the health of families and children are thankful no doubt for the existing policies and programs in place, but unfortunately they have some serious shortcomings. First, there is insufficient income support for families in poverty. Second, current Canadian policy focuses on children, forgetting that they live in a family with parents. Parents' needs in terms of labour, employment equity, education, and childcare are not being met. Part of the problem is that "Canadian policies often separate family support, childcare, and early childhood education" (Bertrand, 1998, p. 35). There ought to be an integrated ecological approach with parents' needs in mind as well as children's (Bertrand, 1998). Third, there is a shortage of integrated community programs and services to offer supportive environments to families (Bertrand, 1998; Jenson & Stroick, 1999). Overall, there ought to be greater access to supportive environments, through building healthy public policy at the national and provincial level, which addresses optimal maternal mental health, maternal-child interaction, and young children's cognitive development.

Barriers to Creating Supportive Environments

Devising healthy public policies to create supportive environments will require significant societal change. It is difficult to convince a political system, which is largely guided by neo-liberalist and neo-conservative elements, predicated on the notion of individualism, to share resources to create supportive environments (Butterfield, 1997; Labonte, 1993). Interestingly, many government documents [e.g. Achieving Health For All: A Framework For Health Promotion (1986), Population Health Promotion: An Integrated Model of Population Health and Health Promotion (1996), Taking Action on Population Health: A Position Paper for Health Promotion and Programs Branch Staff

(1998), and The Statistical Report on the Health of Canadians (1999] espouse the usefulness and the need for greater income equality (Raphael, 2000b). While much is said, little effort is made to eliminate poverty.

The 'lack of political will', or the lack of committed and sustained action taken at the government level in the way of implemented policies, is brought up over and over again by poverty researchers and anti-poverty advocates alike (Huston, 1991; McLoyd, 1990; National Council of Welfare, 2001a; Raphael, 2000b; Wilkinson, 1996), but why do those with the power to eliminate poverty refuse to do so? The problem rests with each individual in society who perpetuates the status quo. The Ottawa Charter emphasizes 'reciprocal maintenance', which is 'to take care of each other' (WHO, 1986, p. iv) - maybe we need to start caring.

Future Research

Issues of Future Research

I felt frustrated reading countless journal articles and books on the topic of poverty and child poverty from research studies over the last forty years while conducting the literature review. The knowledge of the negative, debilitating effects of poverty on families and children is not new, but the problem persists. More frustrating is the lack of solid interventions in Canada to combat it. Thus, a balance between pure and applied research (McCall & Groark, 2000) is suggested to start acting on this knowledge. An applied research study that examines the usefulness of strategies to reduce poverty levels may be a start. Recently I was introduced to such a program, which is called 'Vibrant Communities'.

Vibrant Communities

'Vibrant Communities', a new nation-wide initiative, aims to alleviate poverty by bringing together different levels of society to face the problem of poverty and to strategize ways to decrease it (Vibrant Communities, 2003a, 2003b). The initiative is not focused on 'band-aid' solutions, which only alleviate the effects of poverty. Instead it focuses on 'upstream' approaches that "modify economic, political, and environmental factors that have been shown to be the precursors of poor health throughout the world" (Butterfield, 1997, p. 70). In other words, 'Vibrant Communities' aims to modify the determinants of health in order to increase health. Four key approaches include a) comprehensive thinking and action; b) multi-sectoral collaboration; c) community asset building; and d) community learning and change to reduce poverty (Vibrant Communities, 2003a, 2003b). Overall, these strategies are in alignment with health promotion practices (CPHA, 1996; Epp, 1986; Federal, Provincial and Territorial Advisory Committee on Population Health, 1994, 1996; Green et al., 1996; Hamilton & Bhatti, 1996; Labonte, 1993). Applied research such as this may provide ways to decrease the level of poverty among Canadian families and children.

Conclusion

This study's findings paint a picture of decreased health and well-being for Canadian mothers and young children living in poverty. While the solutions seem complex and somewhat insurmountable, something can be done about poverty. We are not a society without resources, we just need the will to act. What is more, "Canada's future, our security and quality of life depend upon the well-being of our children" (Ross et al., 1996, p. 27), as it is well known that "good health and development during childhood are among the most important factors in making sure that people grow up healthy enough to learn, find work, raise families and participate fully in society for all their lives (National Council of Welfare, 2001b, p. 2). Canada has sufficient national income to provide supportive environments for the health and well-being of mothers and young children in poverty.

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APPENDIX A

Recruitment Poster

QUAECUMQUE VERA

Welfare To Work
RESEARCH PROJECT

Are you living on a low income?

A group of researchers from the University of Alberta is interested in learning how new policies in Alberta are affecting families living on low incomes. We will make recommendations to the government based on what we learn from people who take part in our study. This study is not being done on behalf of a government agency or department.

Volunteers are Needed

to take part in our study. We would like to talk to people who are working at low-paying jobs and have children under five years of age. If you take part in our study we will give you a grocery gift certificate as a thank you for your help.

If you would like to take part in the study, please call

Krista at

Your identity will be kept strictly confidential.

APPENDIX B

Recruitment Contacts

The following community agencies, employment-related agencies, and community professionals were contacted: Alberta Avenue Community Centre, Anti-Poverty Round Table, Bent Arrow, Bissell Centre, Boys' & Girls' Clubs of Edmonton, Candora Society of Edmonton, Clareview Head Start, Community Action for Children, Community Development Professionals, DECSA, Family Violence Prevention Centre, Humans on Welfare, Jasper Place Daycare, Norwood Child & Family Resource Centre, PACE Program, Partners for Kids and Youth, PATCH Place, Poverty In Action, Salvation Army, Striving To Overcome Poverty (STOP), Social Housing Action Committee (SHAC), TERRA, Unity Centre, WE CAN Coop, West End Christian Reform Church, YMCA, and a Youth Outreach Worker.

APPENDIX C

Welfare-to-Work Project
Department of Human Ecology
University of Alberta

A Quantitative Study of the Effects of Welfare-to-Work on Pre-School Children's Health and Development

Information Sheet for Families

What is the purpose of the study?

This study is being done to learn about:

- recent social policies that affect low-income families and their pre-school children; and
- what it is like for people moving from welfare to work.

Who is doing the study?

A group of researchers at the University of Alberta is doing this study. *The study is not being done on behalf of any government agency or department.*

How is the study being done?

If you take part in the study, we will need to meet with you twice. The first meeting will take about 2 hours. The second meeting will be about an hour. We have picked one of your children to learn more about.

In the first meeting the parent or guardian who knows the most about this child will be interviewed. The interview questions are about your family, income, work, and childcare. The researcher will also ask questions about these topics:

- your health
- people in your life who help you
- problems because of low income
- how much time you have to get things done
- your child's behaviour
- what your home is like for your child to learn in.

And, the researcher will videotape you teaching your child something to get an idea about your style of parenting.

At the second meeting, researchers will assess your child's thinking skills.

Who will look at information about me, my family, and child?
The researcher will write down your answers to the interview questions and information about your child's thinking skills. Also, a short videotape will be made of you teaching your child something. Your name and your child's name will not be connected with anything you or your child says or does. Only the researchers doing the study will be able to look at information from the study. All the information written down and videotaped will be locked in a cabinet at the university.

It is the law that any information about child abuse or abuse by a service provider must be reported. This is the only information that the researcher cannot keep confidential.

What are the benefits of taking part in the study?
This study will probably not have any direct benefit for you or your child. But, the researchers hope that findings from the study will assist the government to make policies and programs that help you and other families with low incomes.

As a token of thanks, you will get a $20.00 Safeway or IGA gift certificate once you finish all parts of the meetings. If you finish both meetings, you will be entered into a prize draw. Prizes will include food baskets, hair-products, pottery or other gifts.

What are the risks of taking part in the study?
We do not think that this study will harm you or your family. If you feel upset when you talk to the researcher, she will talk to you more about this. And she will help you find people or agencies to help you. If any of the tests suggest that your child's development needs follow-up, we will help you get help for your child.

What if I change my mind about taking part in the study?
We hope that you will take part in the study until it is done. But, even after you agree to take part, you can stop being in the study at any time in the first meeting. If you finish the first meeting and then decide you don't want to have the second meeting, you may stop at this time. You don't have to give reasons for stopping. If you do not want the researchers to use some things you say in the meetings, they will not use it.

How will the information from the study be used?
The researchers will use the information from this study to give government ideas about how to make better policies and programs for families in poverty. Also, the information will be published and presented at conferences. And, graduate students will use the information for their research projects.

None of the reports, publications, or presentations about the study will ever include your name or other information that would identify you or your family.

The information from this study may be used again in the future to help us answer other study questions. If so, the Ethics Committee at the University of Alberta will first review the study to ensure the information is used properly.

If you wish to get a short copy of the report when it is finished, we will mail it to you.

APPENDIX D

LICOs

Statistics Canada Before Tax Low Income Cut-Offs (2000*)

Family Size	500,000+ (Edmonton)	< 30,000 (Small Town)	Rural**
1	$18,369	$14,559	$12,695
2	$22,961	$18,198	$15,867
3	$28,556	$22,632	$19,735
4	$34,556	$27,397	$23,888
5	$38,640	$30,625	$26,704
6	$42,713	$33,852	$29,519
7	$46,786	$37,080	$32,335

*Statistics Canada LICOs for 2000 were estimated by adjusting the 1999 LICOs to reflect the 2000 inflation rate (2.7%) (CCSD, 2001c; Statistics Canada, 1999).

APPENDIX E

Order of Instrument Administration

	0-36 MONTHS		37-59 MONTHS
Instruments:	1st interview	2nd interview	interview
Structured Interview Guide (includes Social Provisions Scale)	30 min.***		30 min.***
Nursing Child Assessment Teaching Scale (NCAST) OR Peabody Picture Vocabulary Test (PPVT)	20 min.		N/A
	N/A		12 min.
Infant Characteristics Questionnaire (ICQ) OR Child Behavior Checklist (CBCL)	10 min.*		N/A
	20 min.**		20 min.
Home Screening Questionnaire (HSQ)	20 min.		20 min.
Centre for Epidemiological Studies-Depression Scale (CES-D)	5 min.		5 min.
Family Economic Strain Instrument	10 min.		10 min.
Time Stress Instrument	10 min.		10 min.
Bayley Scales of Infant Development II . Mental Development Index		60 min.	N/A
Total Time Commitment	*105 min. (1hr. 45 min.)	60 min. (1 hr.)	107 min. (1hr. 47 min.)
	**115 min. (1 hr. 55 min.)		

** the ICQ is for infants 0-17 months of age*

***the CBCL is for infants/children 18-59 months of age.*

**** the Structured Interview Guide time is based upon an interview with an individual without a spouse, add 10 minutes to time if an individual has a spouse.*

APPENDIX F

Welfare-to-Work Project

Department of Human Ecology

University of Alberta

Consent Form

(For Families with Child Under 37 months)

Title of Research Project: A Quantitative Study of the Effects of Welfare-to-Work on Pre-School Children's Health and Development

Investigators:
a) Dr. Deanna Williamson, Assistant Professor, Human Ecology,
b) Dr. Nicole Letourneau, Assistant Professor, Nursing & Health Promotion,
c) Dr. Janet Fast, Professor, Human Ecology,
d) Fiona Salkie, Project Manager, Welfare-to-Work Project,
e) Krista Hungler, Graduate Research Assistant, Welfare-to-Work Project,
f) Diane Dennis, Graduate Research Assistant, Welfare-to-Work Research,

Consent:

Please answer the following questions by circling yes or no.

Do you understand that you have been asked to take part in a research study?	Yes	No
Have you received a copy of the Information Sheet about the study?	Yes	No
Has the researcher explained the study to you?	Yes	No
Do you understand the benefits and risks of taking part in this study?	Yes	No
Have you been able to ask questions about the study?	Yes	No
Do you understand that you can stop taking part in this study at any time and that you do not have to give a reason?	Yes	No
Has confidentiality been explained to you?	Yes	No
Do you understand who will be able to access and look at the videotapes or written notes from what you said?	Yes	No
Do you understand what the information will be used for?	Yes	No
Do you agree to let your child take several developmental tests?	Yes	No
Do you agree to let your child be videotaped?	Yes	No

The person who can be contacted about this study if you have questions or concerns:
Ms. Fiona Salkie
[redacted]

This study was explained to me by: ______________________________

I agree to take part in this study.

______________________	______________	______________________
Signature of Participant	**Date**	**Witness**
______________________		______________________
Printed Name		**Printed Name**

I am confident that the participant who has signed this form understands what is involved in participating in this study and voluntarily agrees to participate.

____
Signature of Data Collector

Copy of the Report:

Would you like to receive a summary of the findings? Yes No

If you would like a copy, please write down a mailing address where we can send this report. Your address will not be used for any other reason than to send you this report.

Apt #: ________ Street Address: ______________________________

Town/City: ________________________ Province ____________

Postal Code: ____________________

APPENDIX G

Welfare-to-Work: Implications for Preschool Children's Health and Development

Primary Data Collection (Quantitative) Interview Guide

Part I: Family Structure and Sociodemographics:

Family structure and marital status:

The first set of questions is about your family and you – and anyone else who might be living with you.

1. Earlier you said that there are_____ (number) people in your family (people related by blood, marriage, or adoption), living with you here.

What are the names of these people including you, from youngest to oldest?
What are their ages?
What gender is each person?
**In many cases, interviewer will be able to determine gender from person's name – but may want to confirm in some cases.*
How are these people related to_________(*selected child*) (e.g., sibling, parent, grandparent, stepparent, your/boyfriend/girlfriend, your spouse/partner's child…)?
For all children, is this the child's primary residence (living here 70% of the time or more)?

Name	Age	Sex	Relationship to Child	Primary Residence
Selected child:	*Birthdate*			

2. So, the total number of children (0-17 years of age) in your family, living here with you is _________.

3. Marital Status: *If participant has not identified a spouse/partner who they are living with (in #1), ask:* (CHECK AS INDICATED – MAY NEED TO READ TO CLARIFY NATURE OF SINGLE STATUS)

What is your current marital status?

0 Single (never married)
1 Married and living with spouse
2 Common-law relationship

3 Married (spouse/partner lives elsewhere)
4 Separated
5 Divorced
6 Widowed

66 Refused

Part XI: Parental education and citizenship

Now I have a few questions about your educational background …

79. What is the highest level of education you have completed? (DO NOT READ)

0 Less than high school
0 High school
1 Some post-secondary
3 Post-secondary diploma (e.g., college, technological institute)
4 University bachelor's degree
5 University graduate degree
66 Refused

80. How many years of formal education do you have? ________ (years).

66 Refused

81. What is the highest level of education your spouse/partner has completed?

0 Less than high school
1 High school
2 Some post-secondary
3 Post-secondary diploma (e.g., college, technological institute)
4 University bachelor's degree
5 University graduate degree
66 Refused 77 Don't know

82. How many years of formal education does your spouse/partner have?______ (years).

66 Refused 77 Don't know

Now, I'm going to ask a few questions related to ethnicity, culture, immigration, and language.

83. Do you consider yourself Aboriginal/First Nations/Metis?

1 Yes.
0 No
66 Refused 77 Don't know

84. Do you consider ______________ *(selected child)* aboriginal/First Nations/Metis?

1 Yes.
0 No
66 Refused 77 Don't know